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MODEL AIRPLANE NEWS

25th Year of Publication

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by
William Winter

▸ The barrel of fun that the kids have been having with that gallant Dakota is proof enough that Jim Walker (pardon, Veco, for the switcheroo) has something in his suggestion for what he calls a procedure flight plan contest. Briefly, the deal calls for marking your intended landing spot with a flag, estimating the number of circles that will be made in the flight before the wheels touch down, and also the number of seconds the flight will last, the winner to be determined by a point system.

If the circles flown are greater in number than the circles estimated, you multiply the circles estimated by 10, then deduct the number of circles in excess by five. For example, you estimate 13 circles, then fly 17, or four circles too many. So, 13 multiplied by 10 gives 130 points, less the four extra laps multiplied by five, or 130 minus 20, or 110. If, on the other hand, you fly less circles than estimated (let's say 13 estimated and you fly four less, or 9) you multiply the circles flown (not circles estimated as before) by 10, or, in this case, 90 points, and go on to deduct the four laps under times five, or 90 minus 20, for 70 points. If this suggests that it is better pointwise to make too many circles, rather than too few, why not? That's the harder way. Going farther into this thing, you'll find that Walker did everything but allow for whether or not the contestant had raw onion with the noonday hamburger.

The same basic point system is applied to the duration. If the plane remains aloft for more seconds than estimated, multiply the seconds estimated by two, and deduct the number of extra seconds. For instance, the flier estimated 40 seconds, but stays up 50. Then 40 times two, or 80, minus the 10 extra seconds, for 70 points. But if the seconds' duration is less than those estimated, *(Continued on page 4)*

PLANE ON THE COVER

The Supermarine Swift, powerful, very fast, jet descendant of Britain's World War I Spitfire, piston-engined fighter, is the subject this month of artist Jo Kotula's imaginative brush. Readers who saw the British movie Breaking the Sound Barrier will remember the superb action shots of the Swift interceptor. Powered by the Rolls Royce Avon gas turbine, with afterburner, the Swift spans 31 ft. 10 in., and is 41 ft. 5 1/4 in. in over-all length. It is a contender, along with the Hunter, Sabre-100, and bat-like Douglas Skyray for world straight-away speed records.

NEXT MONTH'S COVER

One of the truly great transports of all time, the immortal Ford Trimotor, or Tin Goose, is pictured in its now natural habitat—mountains. Some of these once mainline transports are in service in outlying regions and faraway lands. Ability to get in and out of small fields makes them worth their weight in gold. Ship designed during the twenties by William Stout.

MAN At Work

(Continued from page 2)

multiply the seconds flown by two, and deduct the number of seconds under the estimate. If 40 estimated, and 30 flown, it works out 30 times two, or 60, minus 10, for 50 points.

One hundred points would be given for a perfect spot landing. For every five feet away from the spot, one point would be deducted. If the ship landed 120 ft. from the spot, 24 points would be deducted, leaving 100 minus 24, or 76 points. Points awarded for circles estimated and actually flown, for duration estimated and actually flown, and distance from marker would be totaled. Three flights allowed.

Although all such schemes go through a lot of pulling and hauling in practice before the final answer is worked out, it is apparent that much fun could be had from the concept of attempting spot landings. The flier would make a trial flight or two to line up his sights, so to speak, then mark his expected spot, and try to duplicate the test hop. He would have to have accurate control of his engine run and a rather consistent airplane. If the idea were simplified to the ultimate for club fun contests, a minimum motor run might be specified, like 10 or 20 seconds, depending on the kind of machines and the size of the field. This intrigues us. You'd never want to try it with a Civy Boy. Could you dethermalize accurately? But that Dakota! It's built to circle, is consistent, and has a poor glide. Anything that floats would be baffling. Maybe this is a sport plane event?

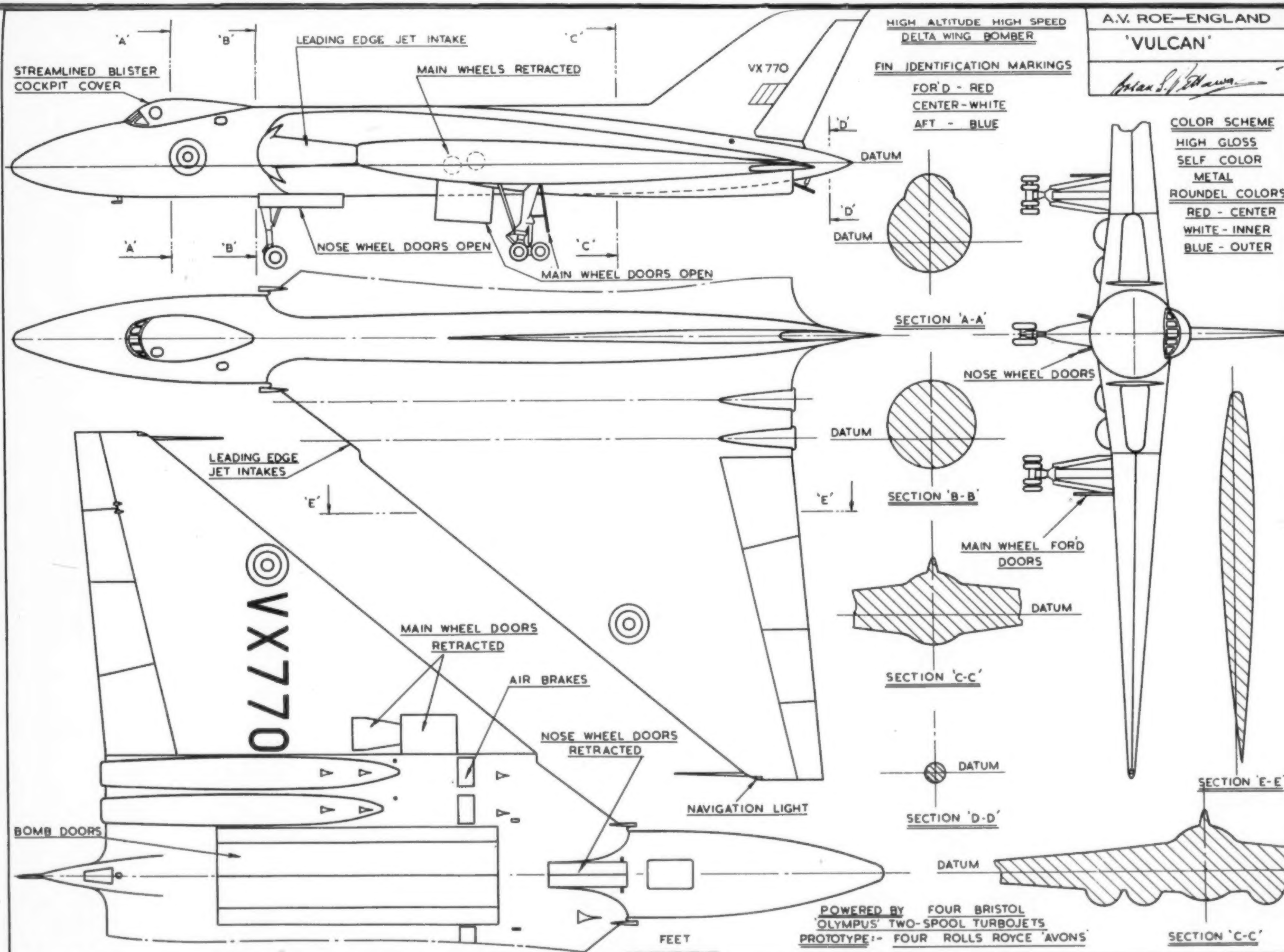
• • •

▸ One of the more fascinating aspects of going out to fly every week-end is the people you meet, and the planes they fly. It was old timer C. O. Wright, former AMA prexy, who pointed out that modeling is the only common interest most of us have. Another seemingly odd thing we have noticed lately is the fact that a high percentage of the week-end fliers travel extensively. When the wind blows wildly, and gab sessions replace the flying, you find that this guy is just back from a sales trip to Australia, that fellow from the Coast, another from Cairo the day before (and is he shivering!), that one from South Africa. Many work for airlines, or aircraft and accessory or equipment manufacturers. Invariably, this type of flier goes in for RC or sport free flight. Asked one chap about his glow engined Sinbad (tow line glider, but had put engine on nose for very stable flight) and, before we finished, had heard about a couple of modelers on the Chilean pampas. Seems our man worked for a movie outfit—see what we mean?—and was flying over the pampas in a hired plane. That great open expanse looked the same at 10,000 ft. as it did at a few hundred. Limitless horizons. Down below were two modelers rog'ing big free flights. Both ships would get airborne, then the fliers would climb on their horses and gallop after them. Flights were so long that they might get in only two hops a day. This reminds us of Don McGovern's minute runs on huge sea planes on Long Island Sound. Chases on boatback. And of Gordon Moore, from California, whose dog, Von, scents his airplanes and does the chasing. How different from the latest flying field we found! The bulldozers are snorting nearby and a sign announces a nearby area will be a parking lot for 2,000 cars.

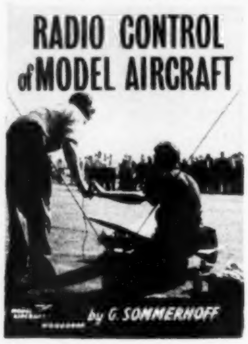
• • •

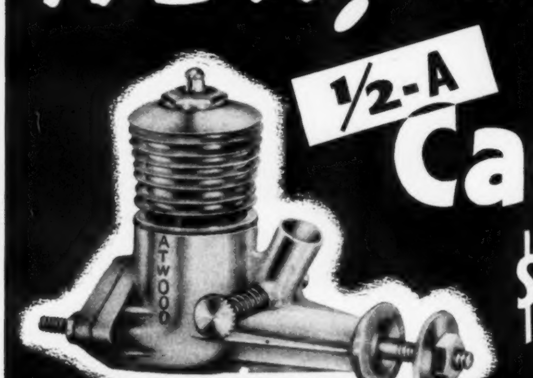
▸ Wonderful discussion with the energetic Hi Johnson, KenHi, who has definite but well founded ideas in controlline, free flight, and RC kits. Subject: a "Bouncer." What's a bouncer? Airplane that bounces. Natch. In

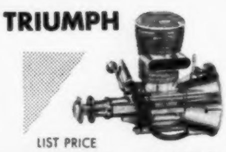
(Continued on page 8)



Avro Vulcan—British Delta Bomber







MAN At Work

(Continued from page 4)

this case it's a stunt trainer which, as Ken puts it, won't be processed back to kit form by pilot error.

"About this Bouncer," says Ken, "we have discovered some interesting things about fiberglass and resin. An airplane of the Cougar type, slab sides and planked leading edge, can be made indestructible by the use of fiberglass. Boatshops in our neighborhood have a patch-up kit, consisting of about 2 sq. ft. of fiberglass cloth (light) and a generous amount of resin, and enough sunlight catalyst to set it up.

"One kit," Ken continues, "will do a medium sized ship and is fairly reasonable. It can be applied almost the same way we would cover with paper, using the resin and catalyst combination the way we would use dope. It can be worked for 20 minutes and will set up solid in one hour, depending on the intensity of the sun. It can be sanded smooth and is 100 per cent fuelproof. Only the vulnerable spots need be reinforced this way to keep the weight down. I have seen several ships with this treatment and am convinced you could play darts in the rock quarry and come out unscathed."

Stanfords, Inc., 1412 W. Burbank Blvd., Burbank, Calif., are coming out with a fiberglass kit (expected price: $3.95) that should take care of any model up to 6 ft. span. This should be especially interesting to RC and controlline boys. Free flighters probably will come around when they see what can be done. Ken thinks the combat boys should welcome it with open arms.

• • •

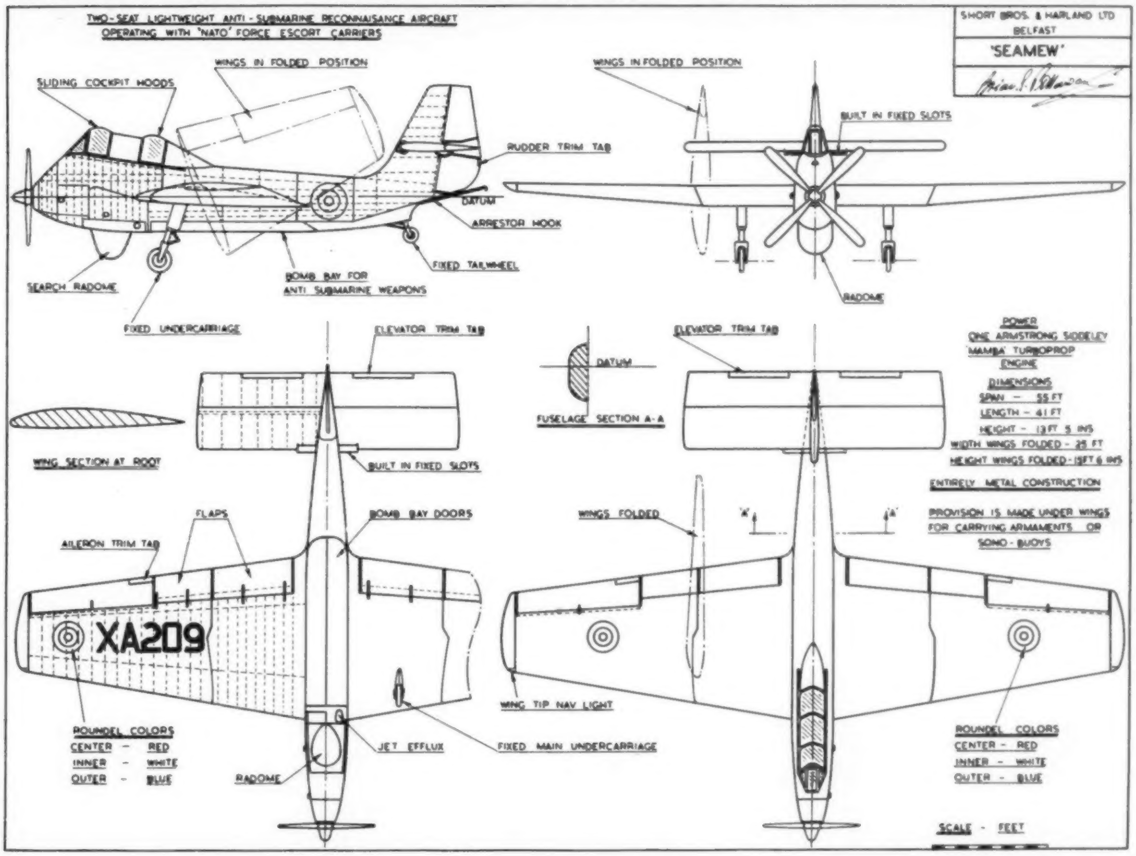
▸ Always surprised at the amount of people who believe that adding downthrust makes a model more tail heavy. Have noted that low powered RC jobs, stally when the engine runs, appear to become more tail heavy when downthrust is slightly increased. Apparently, the ship simply begins to fly faster, more cleanly, and builds up stalls of greater magnitude because of the greater speed. But keep adding downthrust and the nose won't come up. Similarly, have noted that with slight power mush, you can add slight weight to the nose and ship stalls more definitely. Once added four pen cells progressively to a nose and the light mush became a violent stall. So downthrust can make a job tail heavy, and weight added to the nose can make it stall (no one ever told us why), so try this one for size. Swapping these aeronautical riddles with Ken Willard when he stopped us cold. Ship with slight turn to left. Not wanting to foul up adjustments he added slight weight to the right panel. Did the ship turn right? No, it turned more tightly to the left! But, if enough weight is added, ship finally would go right. There's an obvious answer. Can you tell us?

• • •

▸ Few months back, a morning paper contained—on the obituary page—a tantalizing item about a chap, very much alive, name of Sherman Holtz, Fayetteville, N. C., who flew his model for 8 hours, 31 minutes, 50 seconds. Left the paper on the train but got the dope again on the phone. No sooner hung up than Time magazine called and wanted to know all about this world record. Explained it was something akin to kite endurance, flag pole sitting, etc., and that it happens every once in a while. It was quite an achievement, nonetheless. Eight hours going round and round! Fuel fed by pump through a fuel line running out to ship, so we understand. Next day the New York papers contained another item, dateline Fayetteville. Somebody swiped eight confederate cannonballs.

END

Short Seamew—British Anti-submarine



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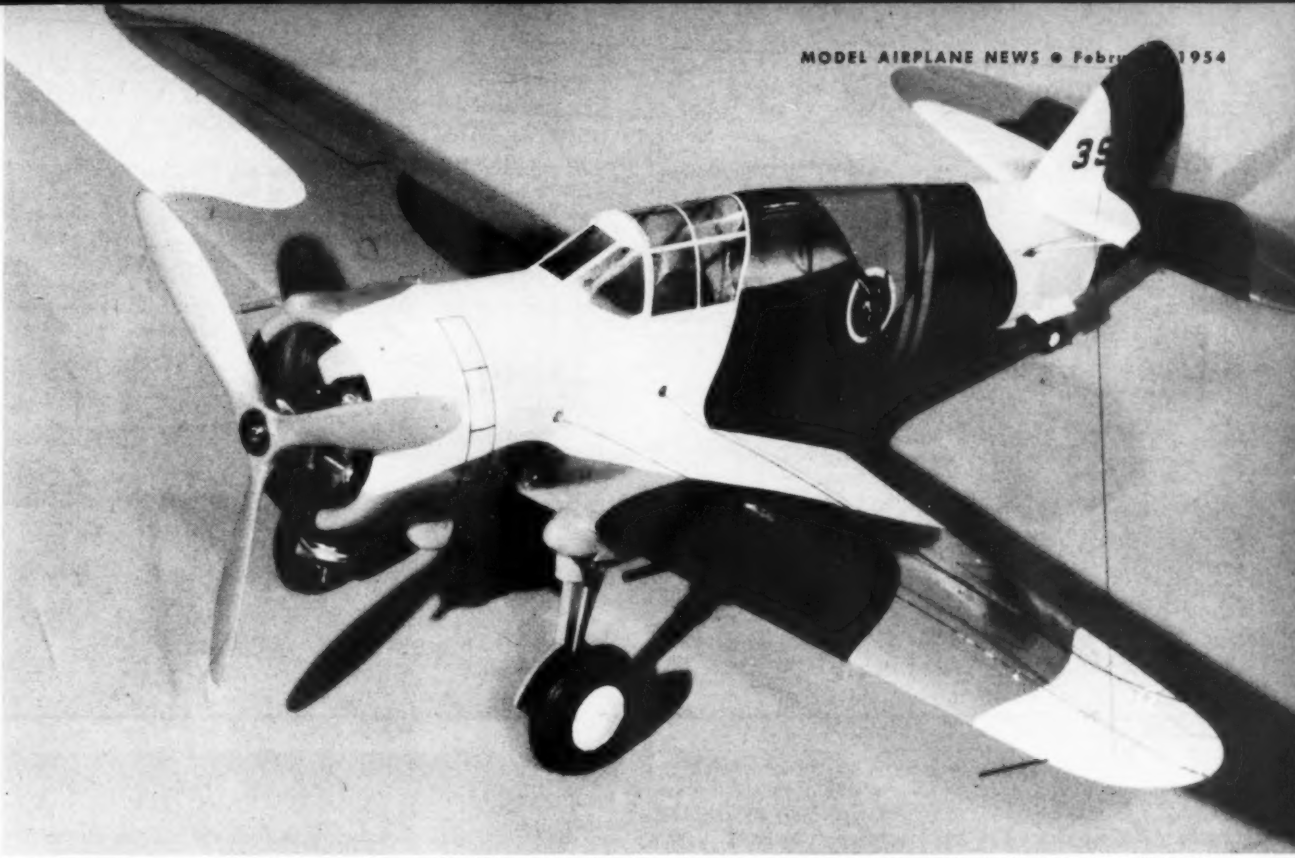
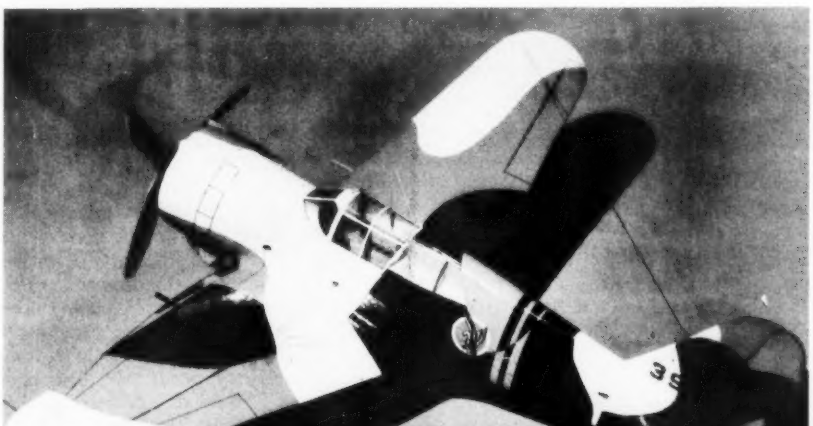


Authentic green, orange and white camouflage of the 27th Pursuit Squadron was used on the original model of the P-36-A or Mohawk.

Last of the Fabulous Hawks

By WALTER MUSCIANO

Curtiss airplanes are no more, but from these gorgeous plans you can build a Mohawk, "75," P-40, P-37, or P-42, all members of the Hawk fighter family. For .14's to .29's—you can't go wrong.

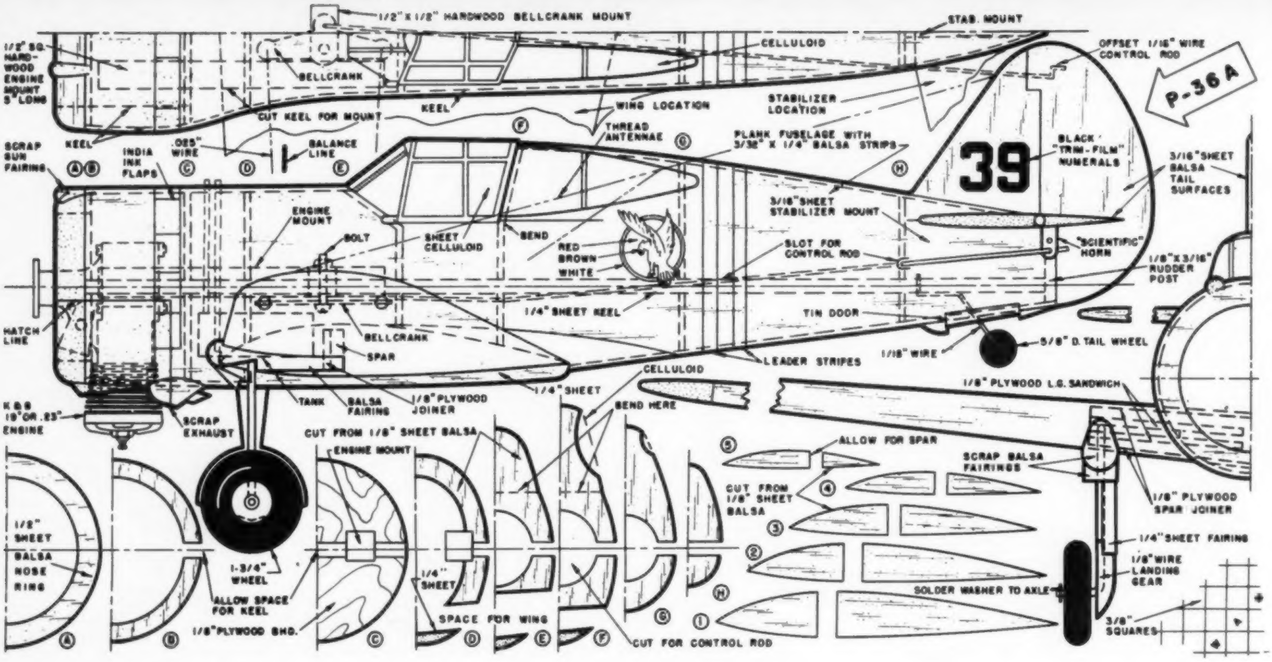


Fuselage consists of bullheads or formers placed between keels, finished by planking with balsa strips as described. Best, most durable method for ships of this type; is 3/4 inch to the foot.

▸ When the Curtiss Airplane Division of the Curtiss-Wright Corp. announced its discontinuance, aviation enthusiasts were amazed. From the earliest days of aviation in the U.S., Curtiss airplanes have held their place among the leading aircraft of all time. The many varied designs produced by this pioneering organization were responsible, to a great extent, for American leadership in the field of aviation. Some of these famous high performance pace setters were the Falcon and Hawk series of combat craft and the Condor and Commando transports as well as the Robin, Osprey, Fledging, Shrike and many others too numerous to mention.

One of the last series of designs of famous Curtiss airplanes was started in 1936 with a neat looking all-metal monoplane identified as the Hawk 75. Many of these non-retractable landing gear fighters were exported to foreign countries, including France and China.

The following year, this design was



improved upon and a retractable landing gear was fitted. Labeled the Hawk 75-A for export and P-36 by the U.S. Army Air Corps, this 294 mph fighter was again improved to attain a speed of 300 mph. This was redesignated P-36-A Mohawk and 210 planes were ordered by the Air Corps in 1938. Weight was 6,010 lb. with a 1,050 hp P & W air-cooled engine. Not contented with this, one P-36-A was reworked to attain 313 mph, having been fitted with a supercharger. This was the P-36-B.

In 1939, the last 31 Mohawks were revised with the addition of two .30 cal. machine guns in the wings to supplement the two original .50 cal. guns of the P-36-A. Weight jumped to 6,128 and speed was 311 mph. Power was the P & W 1,200 hp engine for these P-36-C Mohawks.

Other P-36-A planes were tested with four wing guns, eight wing guns and two wing cannon. These were the P-36-D, E and F, respectively. An additional 30 P-36-G craft was procured in 1942. These were 323 mph Hawk 75-A planes originally ordered by Norway and seized by our Government.

Further experiments were conducted in the attempt to explore fully the possibilities of this design. The XP-37 was an in-line engine version of the Mohawk. Its Allison V liquid cooled 1,150 hp engine drove it to 340 mph in 1937. Not satisfied with the poor pilot location of the XP-37, the tenth P-36-A was fitted with the Allison engine in 1938 and became the famous P-40. Its 1,040 hp engine pulled this 7,215 lb. craft along at 342 mph and 200 were ordered by the U.S. Subsequent modifications contributed to speeds of over 360 mph and a total of over 11,000 P-40 types were built.

Still another P-36-A underwent experimental tests with a radical radial engine in 1938. The crankshaft was lengthened on this engine in order to rival the streamlining of in-line engines. This 6,260 lb. XP-42 sped along at 315 mph with this unusual P & W 1,050 hp powerplant. It is experiments and exhaustive tests such as these that helped create the super fighters of today and tomorrow.

We built the P-36-A Mohawk not only because of the very interesting color scheme available but because it is representative of U.S. pre-war aircraft that evolved into one of the aerial defenders of freedom. Our 3/4 in.-to-the-foot scale replica can be fitted with most engines from .14 to .29 cu. in. displacement.

Construction is started by shaping the wing spar and following up with the plywood joiner. Cut the sheet balsa wing covering to outline shape and butt join to the correct chord width. Cement the spar to the lower covering. Cut the ribs to shape and cement these to the spar and lower covering. Hold in place with pins until dry.

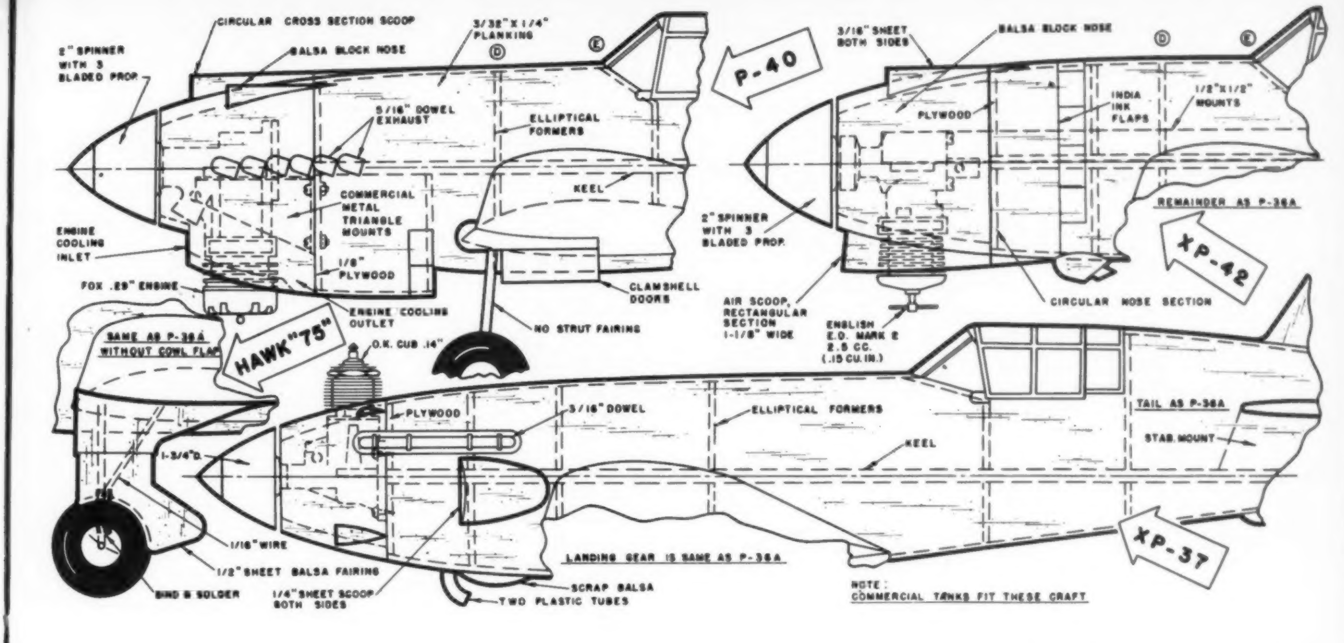
The landing gear is very important and should be very firmly installed. Bend the wire struts to shape, one left and one right side. Sandwich the struts between two pieces of plywood using plenty of cement. When dry, the plywood is cemented into the wing and additional cement is poured around this joint. This method of installation has been used successfully for many years and withstands the most punishing abuse.

Bevel the lower covering trailing edge and add the upper covering at this time. The solid balsa wing tips are now cemented in place. When thoroughly dry, the entire wing should be well sanded with 1/0 and 3/0 sandpaper.

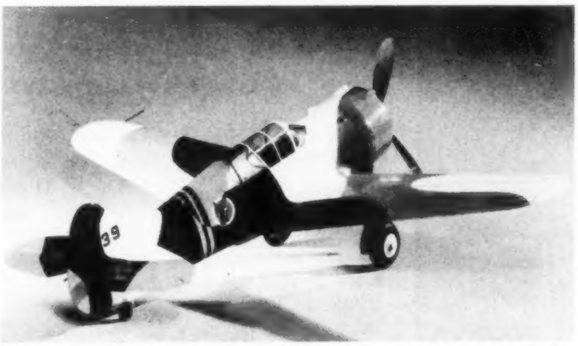
Cut the fuselage keel and formers to shape and cement the engine mounts (if required) and formers to the keel. The engine can be mounted upright or inverted and installed on either wooden beam mounts as we did, radially on the plywood bulkhead, or on commercial metal triangle mounts which are bolted to the plywood bulkhead. The selection is up to you and is, in some instances, governed by the engine you intend to use. We find that the K & B type of metal mounts permits the simplest methods of engine installation. Cement this fuselage framework onto the wing, being certain that the incidence angle is zero.

The entire empennage should now be cut to shape and sanded to a streamlined cross section. Join the elevator halves by means of the dowel spar and add the control horn. Hinge this assembly, with cloth strips, to the stabilizer. Add the sheet balsa stabilizer mount onto the keel and cement the stabilizer atop this. Add the tail wheel strut firmly to the keel.

Attach the wire lead-out lines to the commercial bellcrank by twisting the ends and soldering. Bolt the bellcrank to the hardwood mount and cement the mount to the fuselage structure. Bend the wire control rod and attach to the horn



FULL SIZE PLANS AVAILABLE. SEE PAGE 52.



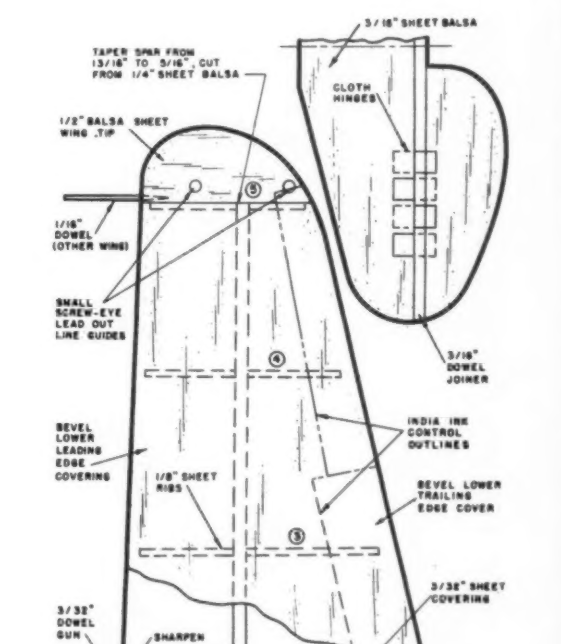
Put a dummy pilot in this one and you'll have a lifelike scale job. Fly on 25-40 foot lines for small engines; 36-60 foot for big mills.

and bellcrank. Offset the end as shown or solder a washer to the control rod ends to prevent it from slipping off the horn or bellcrank.

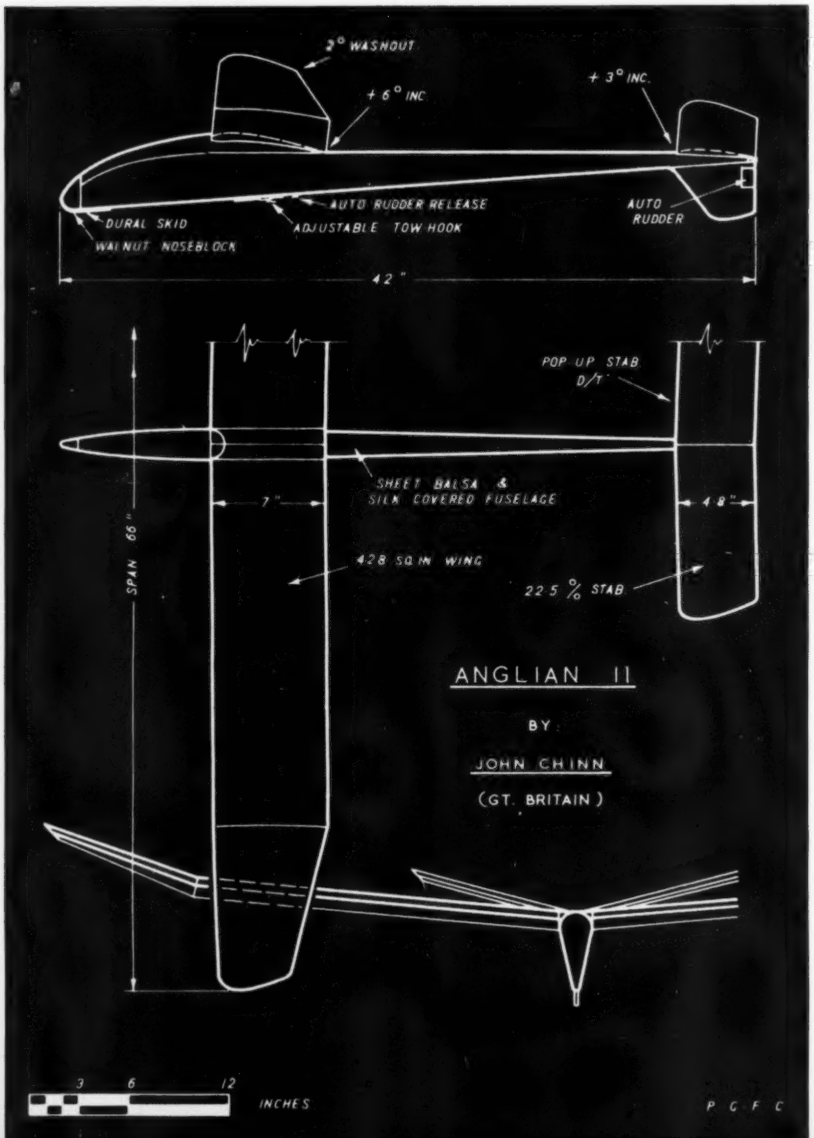
Numerous commercial metal fuel tanks can be used in this plane. If necessary, a portion of the leading surface of the wing covering can be cut away to accommodate the tank. Do not cut any portion of the spar. The tank must be rigidly mounted and plastic tubing filling, feed and vent lines added.

The entire fuselage is now planked with medium sheet balsa strips. These should be cemented to each other as well as to the formers. As planking progresses, it will be found necessary to taper and bevel each strip in order to insure a minimum of cracks and open spaces. When planking is complete, all these cracks should be filled with Aero Gloss Plastic Balsa or Testors Fyll. This should be forced into all crevices with the fingers. When thoroughly dry, the entire fuselage should be sanded until absolutely smooth. Mold the fillet with either of the above mentioned compounds. The fillet should be made in several layers to build up to the desired shape and size. Do not hesitate to make the fillet oversize because it can very easily be sanded to shape.

Install the landing gear fairings now. These can be carved from scrap balsa. The strut fairing should not touch the wing in order to allow the landing gear to flex. Add the fin and rudder and be certain to offset the rudder 3/8 in. to force the model away from the center (*Continued on page* 40)



Most graceful of all international competition types, the A-2, or Nordic, is rapidly gaining favor in the U.S. Here shown, John Chinn's sleek Anglian. Profile shapes said to be of small importance.



? HEP ON NORDIC ?

Part One

By P. G. F. CHINN

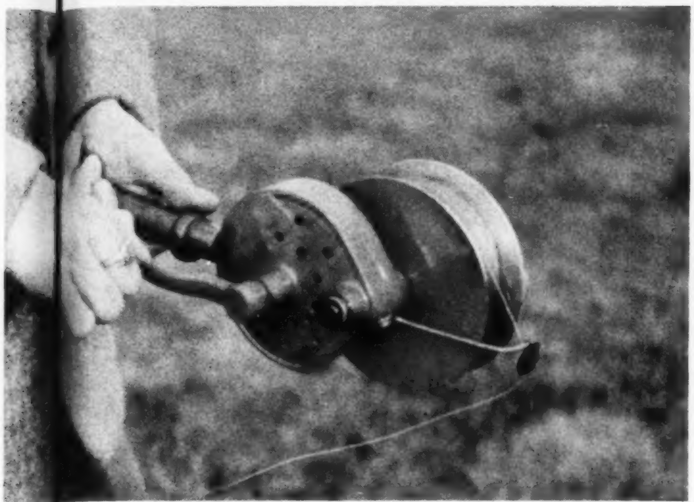
Late starting America has huge handicap to overcome. Here are more important facts, figures.

The Nordic specifications were originated by the Scandinavian countries immediately after World War II. Three classes were drawn up: A-1, A-2 and A-3, but, of course, the A-2 has become by far the most popular, particularly since it was taken up by the FAI and adopted, from 1951, as the official World Championship glider class.

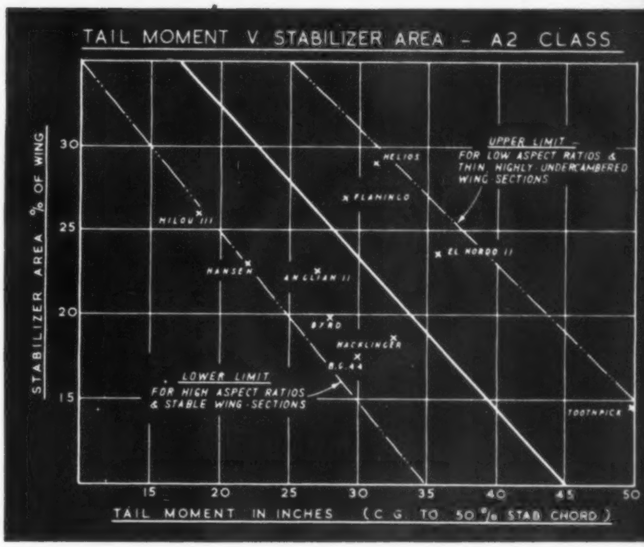
Nordic A-1 gliders are a smaller class, the models built to this specification being about the same size as a Wakefield class rubber job. The A-3's are at the opposite end of the scale, a *minimum* total area of 40 sq. decimeters (620 sq. in.) being required.

The A-2 rules demand a model having a minimum weight of 410 grammes (14.46 oz.) with a total projected horizontal surface (i.e., wing and horizontal stabilizer) of between 32 and 34 sq. decimeters (495-526 sq. in.) The minimum fuselage cross-sectional area at its biggest point must be at least 34 sq. centimeters (5.26 sq. in.) These rules come within the framework of the FAI general rules for contest models and A-2's are, therefore, eligible for FAI open glider contests or for record setting.

As we would reasonably expect, the Nordic countries, Sweden, Denmark, Finland and Norway, have been well to the fore in A-2 International competition, having gained much experience of the type prior to its elevation to World Championship status. Actually, they had not, prior to 1953, registered an out-



Winch is essential. Standard type is a converted bench grinder, pictured. Rules specify that the line be reeled in as soon as the tow is made.

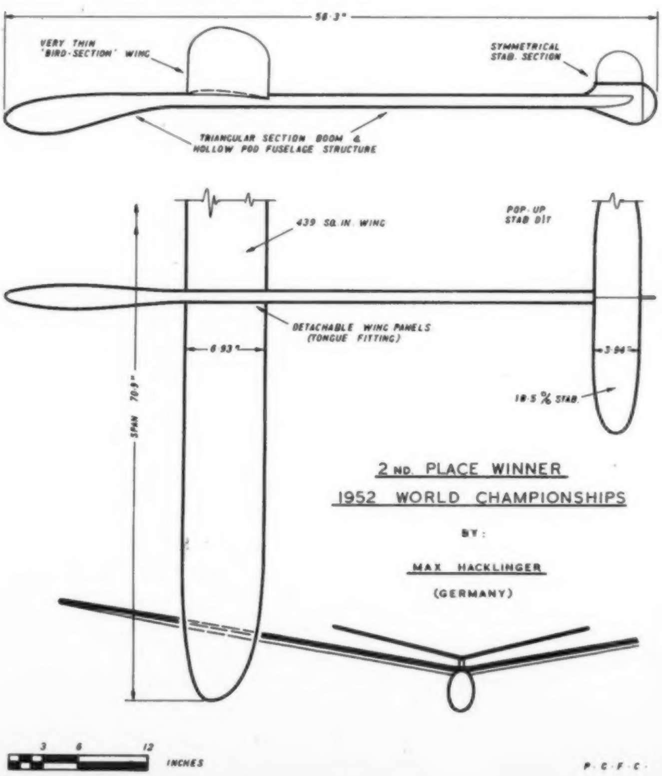


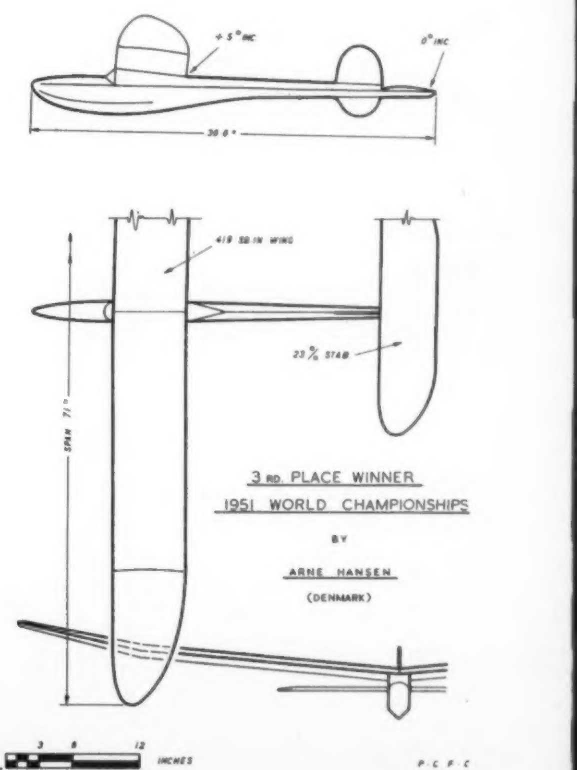
right win in the present series, Austria being the victor in 1951 and Yugoslavia in 1952, but much of the progress made in A-2 design and contest technique can be traced to their influence. Last year, Hans Hansen of Denmark placed first at Lesce Bled.

The annual World Championship event for A-2's is for the Swedish Cup—the Wakefield of the glider world—and to get among the top-liners, you must have a model capable of a still-air duration in the region of four minutes from the regulation 100-meter (328 ft.) towline. This means that you have to have a model which is a good deal better than we would have thought possible a few years back and, more important, you must know how to handle it.

The model must tow right up overhead on the line. The story goes that one top A-2 man casts off at 338 ft. altitude—328 ft. of line, plus an 8 ft. reach, plus a 2 ft. high jump! This isn't to be taken seriously, of course, but it is a fact that everything is done to gain the last few feet of altitude.

For example, the thinnest practical towline is used in order to reduce drag and thus insure that the towline is as near as possible to being straight and vertical and the model thus at the greatest possible altitude at the moment of release. Nylon is much favored as towline material in view of its adequate strength in small sections but very thin high-tensile steel wire has also been used by some (*Continued on page* 51)





After Junior Chamber of Commerce survey that showed most boys purchasing models built them hit-or-miss fashion, first goal of Clinic was to teach basic elements of construction, flying to youths between ages of 9 and 15. PAL kits were used for their simplicity, ease in construction.

Clinic that CLICKED!

When members built their B-29's as a tie-in with movie "Wild Blue Yonder," actor Forrest Tucker visited Clinic, told experiences on location.

An average of 26 boys attended each of the two weekly classes that were organized at the beginning. Sustained interest shown by all but seven.

Millions of kids like these could build models if given a break. It was found random, successful builders were ignorant of all contest activity.

by JOHN W. PEARSON

And whatever happened to Charlotte, N. C., the city that banned gas models? Far from giving up the ghost, the local Junior Chamber of Commerce has going program with sensational possibilities.

On July 4, 1951, the Fourth Annual Carolinas Model Flying Circus was held in Charlotte, N. C. Although the contest was a huge success, the sponsors were shocked by the lack of local entries. After the entries were tabulated as to age and home, it was discovered that Charlotte had only two entries compared with 20 or more in prior years. Investigation proved that a great majority of the local men who had formed the core of the Charlotte Model Club had gone into the service and the club had disbanded. But on the other hand, sales of models had picked up over previous years.

The Aviation Committee of the Charlotte Junior Chamber of Commerce made a survey and found that the boys purchasing the models were building them on a hit-and-miss proposition and that the ones who were successful knew nothing of contest flying and were afraid to take the first big step.

The Jaycees started planning a Model Clinic. They had two goals in mind. One, to start at the very basic elements of model building and teach the construction and flying of models to youths between the ages of 9 and 15. The other

Series of local contests was the second need highlighted by the survey. These meets gave members of the class understanding of contest rules, flying.

B-29 pilots judged Superfort models. Winner announced at a private showing for Clinic members; classes established 10-15 local churches.

Instead of annual Carolinas Model Flying Circus, which had two local entrants in '51, Jaycees last year held non-sanctioned meet for beginners.

goal was to form a series of local contests so the members of this class would understand contest rules and flying.

After much investigation, the Jaycees decided to use the PAL kits for the basic class. These kits were simple, yet complete and were the easiest for group instruction.

The publicity for the first class was simple, yet effective. A booth was secured at the State Fair and application blanks were available. One window display was put in the Charlotte Hobby Center for a period of one week and a small announcement was made in the paper. The Jaycees hoped for 20 to 30 applications for a start but were deluged with over 50 in the first two days. The applications kept coming until about 250 were on file.

Thirty boys were picked to be in a class. Since it was impossible to take all of the applications, it was on first come, first served basis. Letters were written to all boys explaining that it was impossible to hold more than two classes a week at the present time, but Jaycees would attempt to start other classes as soon as possible.

The attendance at the two classes per week was remarkable with an average of 26 at each class. The boys who dropped out of both classes totaled seven. It was much better than all expectations. The Jaycees found that one instructor was needed for every five boys. Interested parents were welcomed.

At the completion of each model, various types of contests were held. Prizes were given for flight, appearance and individual progress. One contest was held in line with the picture "Wild Blue Yonder." (*Continued on page* 50)

Once boys learn contest flying, it is believed they won't hesitate about entering sanctioned meets. Two hundred boys in last year's classes.

More efficient force set-up of the shoulder-wing types makes for fast, high performance. Area of just over 200 sq. in., combined with any of the newer, hotter Half-A's—oo-la-la!

The Apache

by LLOYD V. HUNT

This airplane wasn't created; it was developed through three test ships. From prop to pop-up tail, it's best in modern design.

Unlike most models, the Apache was developed and not just designed. From experience we have found this necessitated constant attention to practical construction and design styling. After a review of our past contest designs and a carefully planned layout of what we were attempting to achieve, we derived the configuration presented.

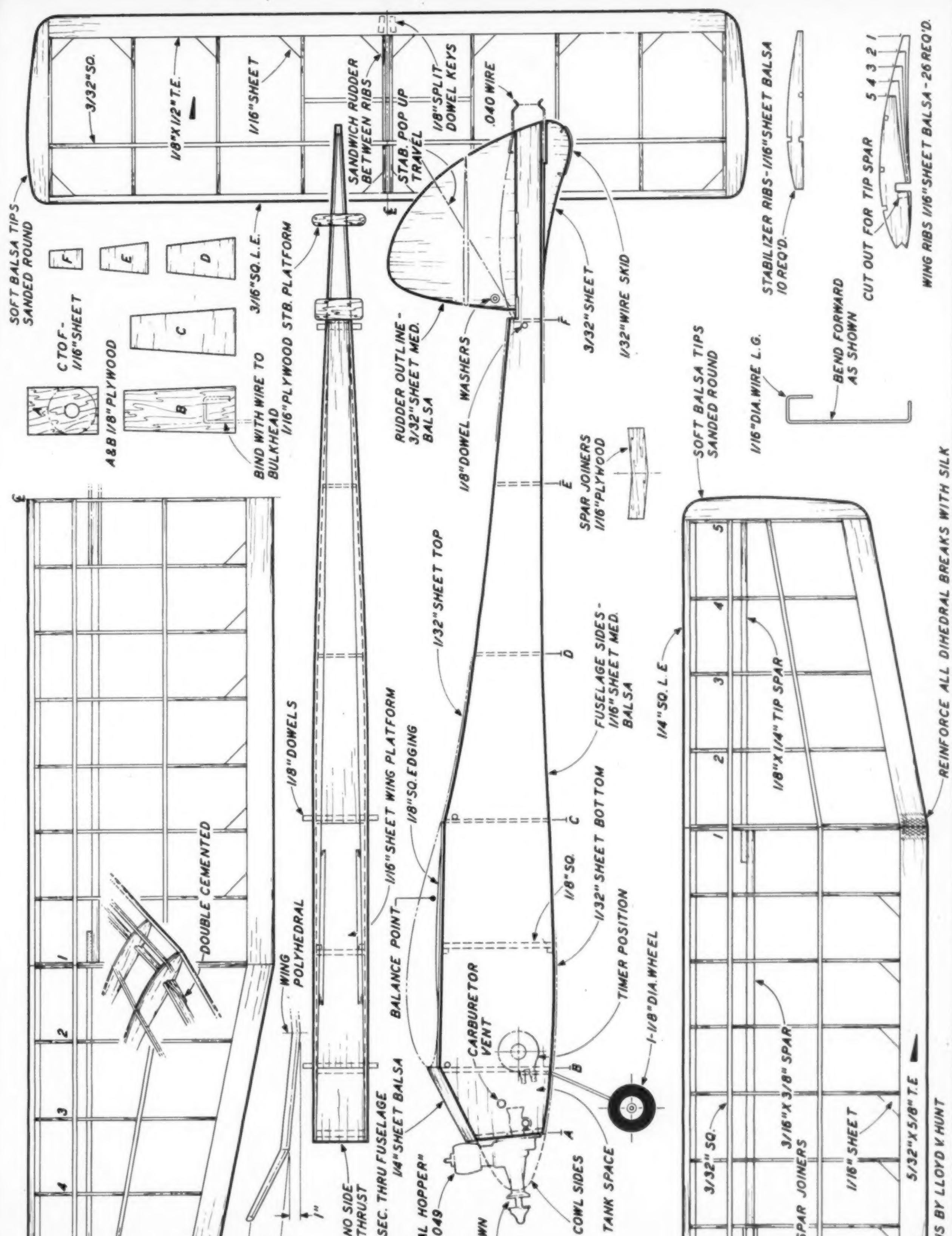
In all, three models were constructed with special attention to: 1. power; 2. size; 3. center of gravity location in relation to the thrust line; 4. adaptability from .049 displacement to .49 cu. in. Consideration of the pylon trend was abandoned.

The model, when launched, climbed to the right and was trimmed to circle left. When first tested under power, we expected the model to spin in. To our surprise, the model, after approximately a 90° flat turn, started upstairs, but fast. We test flew the Apache with a five second motor run; then tried a 15 second run and lost the model. Yes, the dethermalizer was lit and operating.

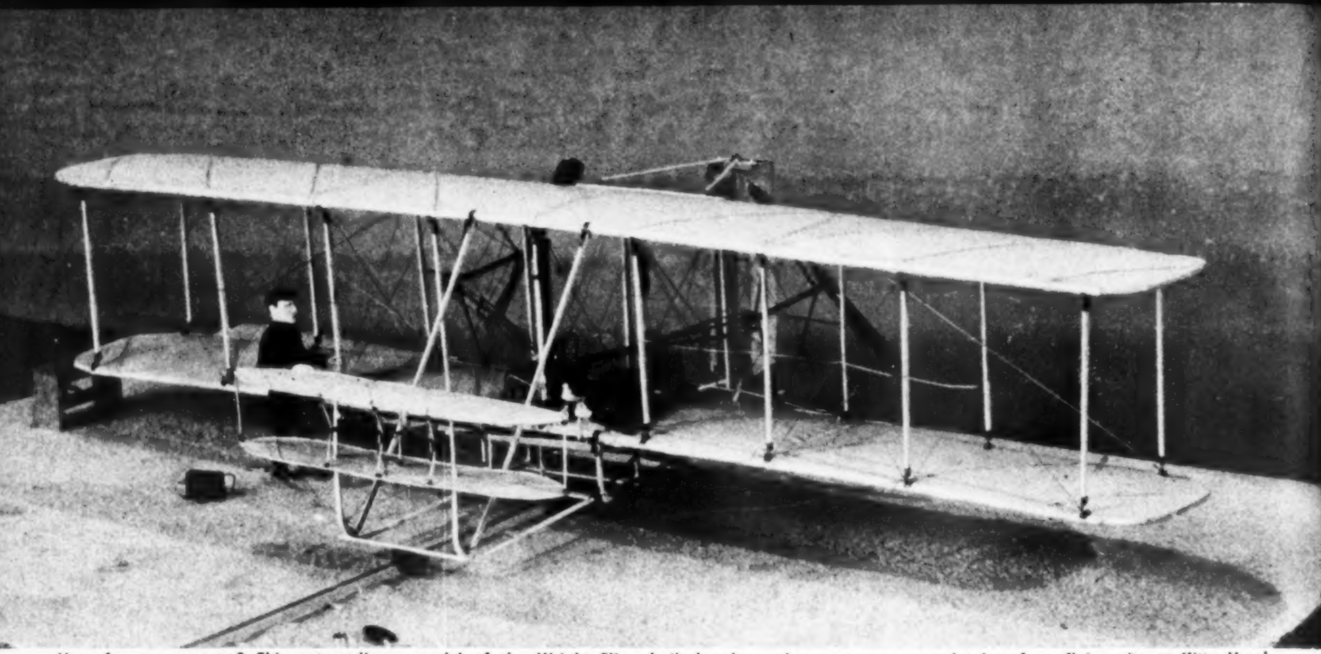
Through association with model builders we have developed a healthy respect for their ability to follow plans. Consequently, we have omitted the usual detailed description of construction. Fuselage construction is begun by cutting the two sides, then the formers as shown. Note that the landing gear is bound to former "B." Lastly, cement in place the firewall. Cowl side panels may be added. Mount the tank and shut off timer, plus dowels and other details. Fuelproof between "A" and "B" thoroughly. Wing and tail are of simple construction. The use of a tin template for the ribs will speed construction. The 3/32 sq. spars used in construction are to preserve the airfoil section used. All parts are covered with Japanese tissue. Brush or spray the model with four coats of dope. Follow by fuelproofing. Test glide first, then try low power flights. Good luck!

Attractive styling sets the Apache apart from done-to-death pylons, cabins. Unique feature is elimination of tricky side thrust adjustments.

Flapping wings may work well on ornithopters but don't belong on a free flight. Heavy bottom spar, top spars, keep wing from folding.



FULL SIZE PLANS AVAILABLE. SEE PAGE 52.



How far can you go? This extraordinary model of the Wright Flier, built by the author, rests upon sand taken from flying site at Kitty Hawk.

36 YEARS OF SCALE MODELING

By CHRISTY MAGRATH

▶ You like a particular plane or helicopter and want to build a scale model of it. Not a flying model necessarily, but a well detailed exhibition job that is a perfect miniature of the original.

So, you go to your favorite hobby shop and if Joe Jinks doesn't have it, he can usually get it for you. Maybe it's one of the new plastic kits you pick. You bring it home, cement "A" to "B," etc., put the decals on and in no time at all, so to speak, the job is finished.

Or you decide on an all wood job. Today, most parts are either shaped or semi-finished and very little time is needed to turn out a good model.

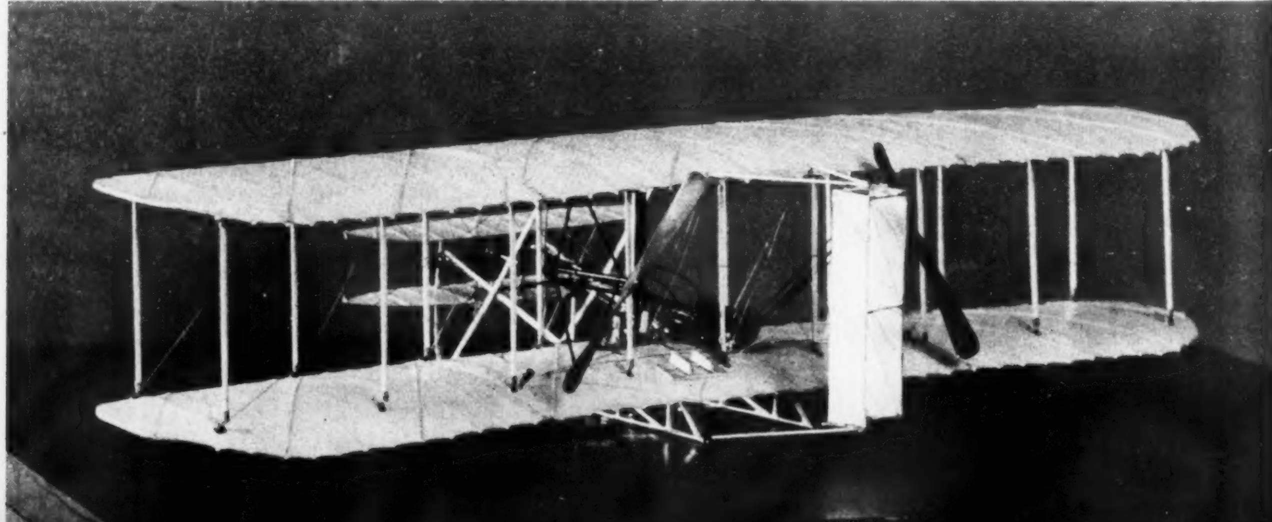
But it was not always like this; nor is it today, if you want to make a really perfect model for a museum, aircraft factory, or a choosy type of collector.

I have watched the development of flying in general and the art of model making since I was five years old.

It is October, 1910. Arch Hoxsey has just taken Teddy Roosevelt up for his first airplane ride at dear old Kinloch Field in St. Louis County. Alfred LeBlanc of France sets a new world speed record by flying his pretty little Bleriot monoplane 65 miles an hour. I can't fly in these ships as I want to, so we go home and I try to paste together something resembling the sky marvels out at Kinloch. My parents are amused at my fumbling, and I am furious but determined. Crude Wrights, Benoists, Bleriots, and others were made of scrap wood, cardboard, and Lord only knows what.

However, by the end of 1917, I was making nickel, dime, and quarter Albatross, Fokker tripes and Gothas by the score. These were being used for air rifle

Rear view of same model suggests its infinite detail. Magrath thinks nothing of making scale hex nuts from pin heads, under powerful glass.



This article does not tell how a model is made. Or how to operate an engine. It's a simple tale of craftsmanship and devotion. As such it deserves publication.

targets by the neighborhood kids. I was making cardboard Jenny's for store windows and getting up to a dollar apiece for them. An occasional copy of one of the leading mechanical magazines would show pictures of some of the planes flying in France or at one of our training centers. These magazines never showed any drawings, so I would make crude drawings of details by watching the low flying Jenny's that often came over from Scott Field near Belleville, Ill.

When a "Libery Loan" flying circus stopped at St. Louis late in 1918, I really went sketch happy. We had a reenactment of the death of Manfred Von Richtoffen, when a couple of British airmen flew, respectively, a Sopwith Camel and a Fokker triplane painted like the Baron's last.

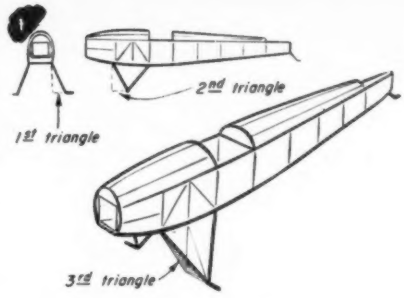
To digress a moment, I have yet to see, even today, a more maneuverable airplane than that fascinating Fokker triplane of 1917-1918.

I sketched SE5's, a Spad, the "tripe," Camel, Sopwith Pup and the cockpit of a Jenny. Until I got hold of my first aero magazine shortly afterward, all my models had Jenny cockpits. My customers didn't know the difference then, nor did I. For Christmas of 1919 I got an Ideal DH4 kit. This was an 8 oz. job with enough rubber when cranked up to make the prop break your finger. I flew it along with other Ideal models for several years.

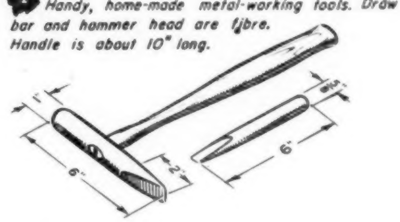
By trial and error I learned many tricks of shaping wood, tin and cardboard for display models. NC-45's, Orioles, Buranellis, Lawsons and others all helped to develop the art. I started a little "circus" in 1920 with 94th Squadron World War I planes, but kept selling the models and never completed said circus. I really meant a miniature first pursuit group, as some Spads and Nieuports had the 95th Squadron's kicking mule inked on each side of the fuselage.

Many years of developing new ideas in making this or that detail followed. MODEL AIRPLANE NEWS in earlier issues published some very fine dope on expert model building, but I am offering herewith for the first time information from my own files. I hope the suggestions and hints presented will help the serious model builder do even better work.

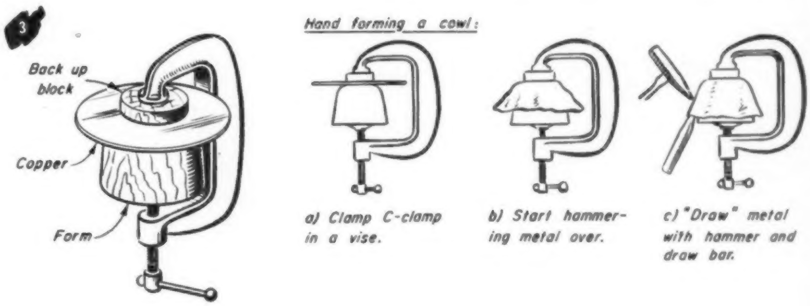
There are a lot of hobbyists today equipped with fine home workshops where museum (*Continued on page* 42)

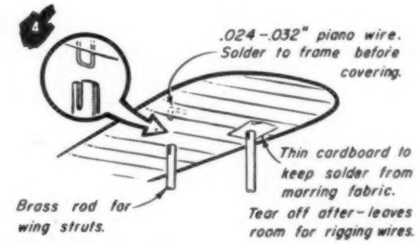


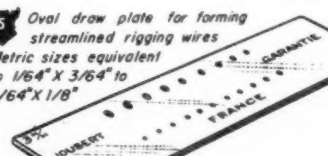
For real accuracy, calculate true lengths of landing gear members. Use these sketches in conjunction with formula given in text.



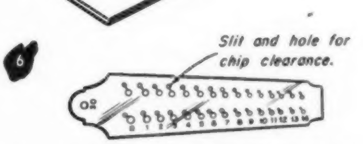
Handy, home-made metal-working tools. Draw bar and hammer head are fibre. Handle is about 10" long.



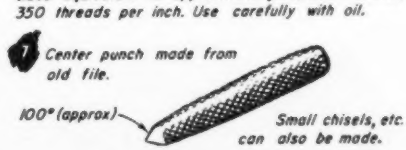




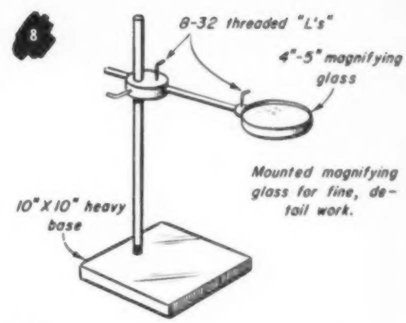
Oval draw plate for forming streamlined rigging wires Metric sizes equivalent to 1/64" X 3/64" to 3/64" X 1/8"



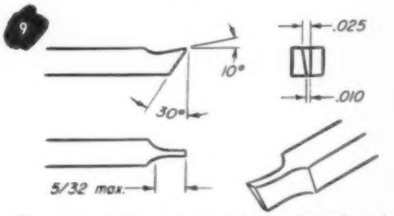
Screw plate. Double row of same size dies; metric sizes equivalent to approximately .020" to .080", 350 threads per inch. Use carefully with oil.



Center punch made from old file. Small chisels, etc. can also be made.

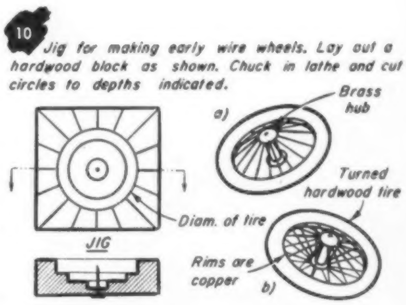


Mounted magnifying glass for fine, detail work.

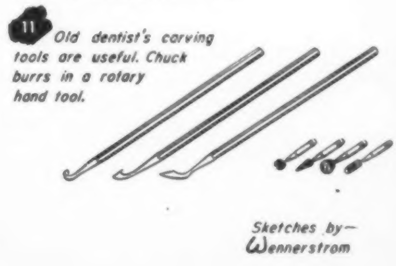


Fin cutter from tool bit stock. Large size aircraft rivets make good cylinders. Set cutter about 10° above center of rivet being finned.

Jig for making early wire wheels. Lay out a hardwood block as shown. Chuck in lathe and cut circles to depths indicated.



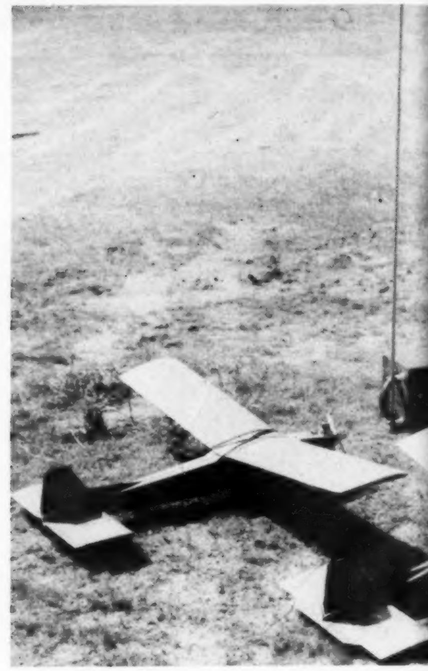
Set tire in jig. Prick punch spoke positions. Drill normal holes .002" smaller than wire used for spokes. Set hub on nail. Using a tooth pick, plug top of hub to keep out solder. Set drilled tire in jig with spokes inserted but cut oversize. Center assembly and solder spokes to shoulder of hub. Remove from jig, repeat on other side. Trim and file spokes to tire.



Old dentist's carving tools are useful. Chuck burrs in a rotary hand tool.

Sketches by—Wennerstrom

Hand-launching can be accomplished without the usual 50-yard dash. Just give this crate a straight-away toss. Wing and tail construction is noticeably simple. Fuselage is sheet with few bulkheads.



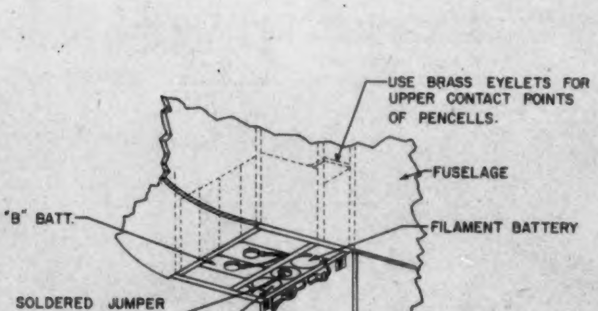
These ships have been flown, in various sizes, .09's, .065's, and .149's. When trimmed to fly really flat,

The Impulse

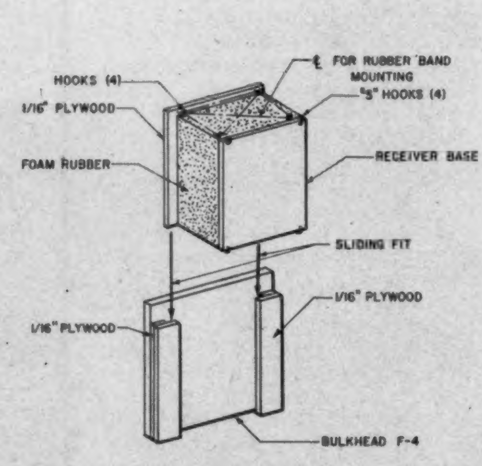
A small, inexpensive, maneuverable RC job for .09 power. Robust construction is combined with a high degree of wind penetration. Pylon racing possibilities.

by BILL JOHNKE

▸ If you are in need of a simply built, rugged and reliable RC model capable of flying in small or large areas, for either advanced contest flying or sport, the Impulse is your airplane. Here is a radio controlled ship, developed after several years of personal flying and observation of large and small models, designed for specific RC performance with the simplest of radio equipment,

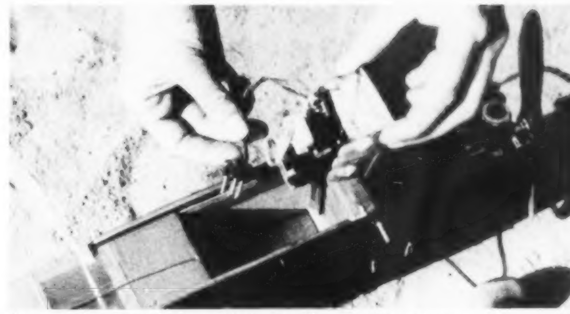


DETAIL OF BATTERY COMPARTMENT



DETAIL OF RECEIVER CHANNEL AND MOUNTING

the Impulse is a good possibility for pylon racing. So trimmed, it will not climb on the straightaways, while the "kick" elevators hold up nose on turn.



Neat receiver installation eliminates floppy wires. Foam rubber mounting completely protects receiver, even in event of a vertical dive-in.

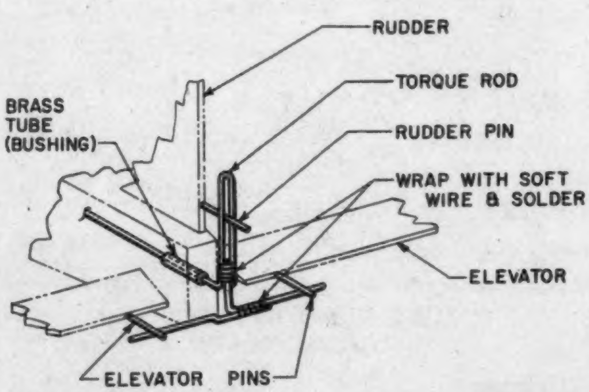
Aluminum exhaust shield, held over leading edge by hold-on rubbers, prevents entry of exhaust into radio compartment. A point to practice!

yet able to do much better than merely hold its own against more complex and expensive aircraft and equipment. Among its features is a simple but efficient means of obtaining flight trim longitudinally and up-elevator in conjunction with rudder, which is capable of keeping the nose of your ship from dropping during tight turning maneuvers.

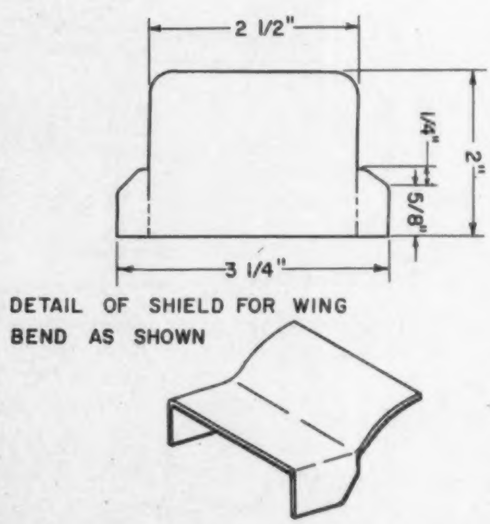
Ease of field maintenance, checking and flying are paramount to any flyer. Here the headaches of accessibility to batteries, escapement winding, trim, controls, meter insert, etc., are eliminated by proper placement and construction. Thus, all parts are conveniently at hand, but still out of the way of accidental alteration during handling, launching or flying. The radio mount and compartment eliminate loose wiring from fouling up critical tuning adjustments and prevent practically any damage to the radio gear.

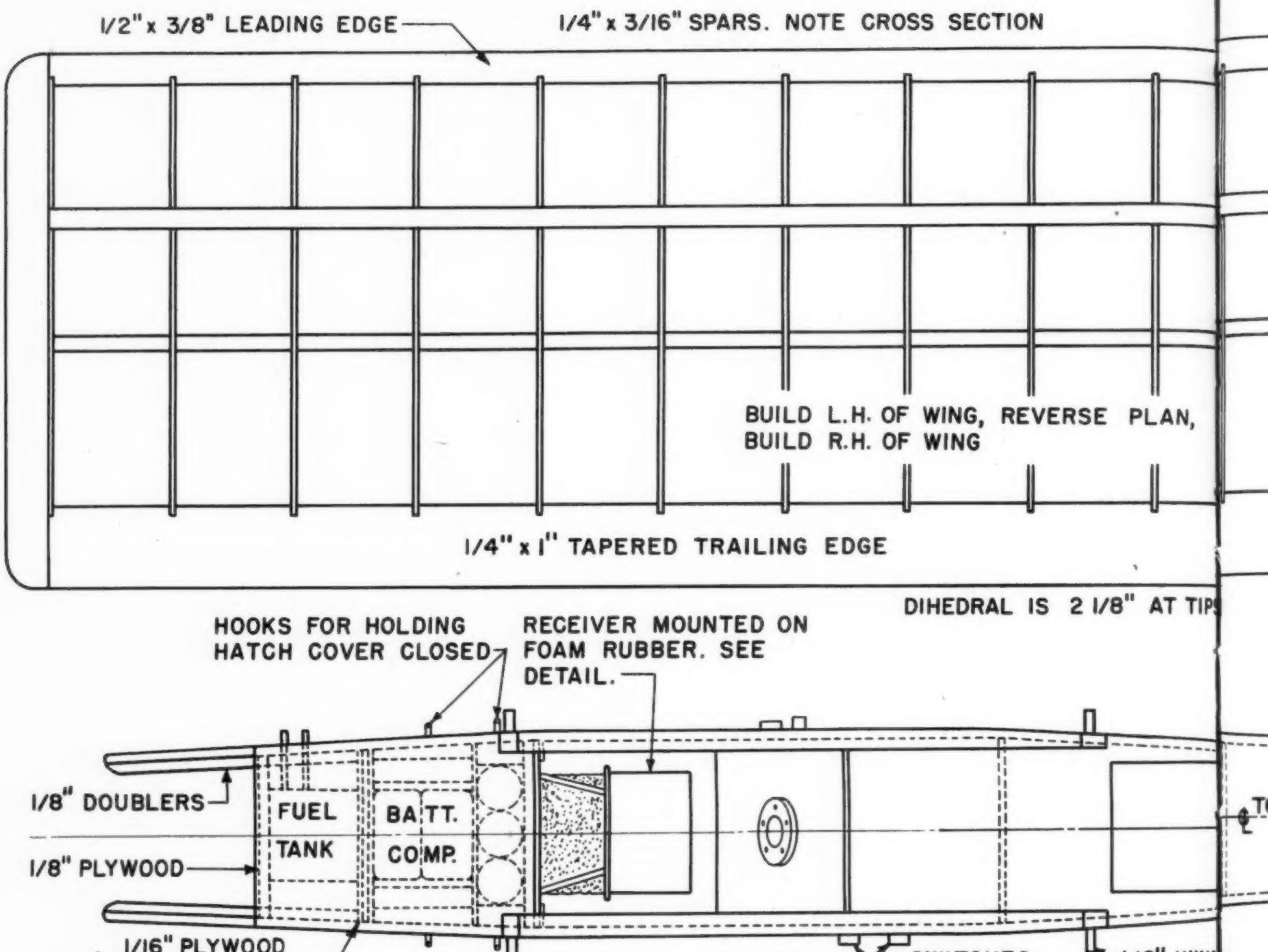
The original model of the Impulse has been flown now for over two years on almost every Sunday, and on many other available days, winter and summer, through practically every known RC maneuver (and even some that aren't known) together with more than a few hearty dives into terra-firma through dat ole debbil "pilot error," and to this day the radio and allied equipment have withstood all the torture to which they have been subjected. In all that time the model itself has sustained not one serious (*Continued on page* 33)

PLANS ON FOLLOWING TWO PAGES

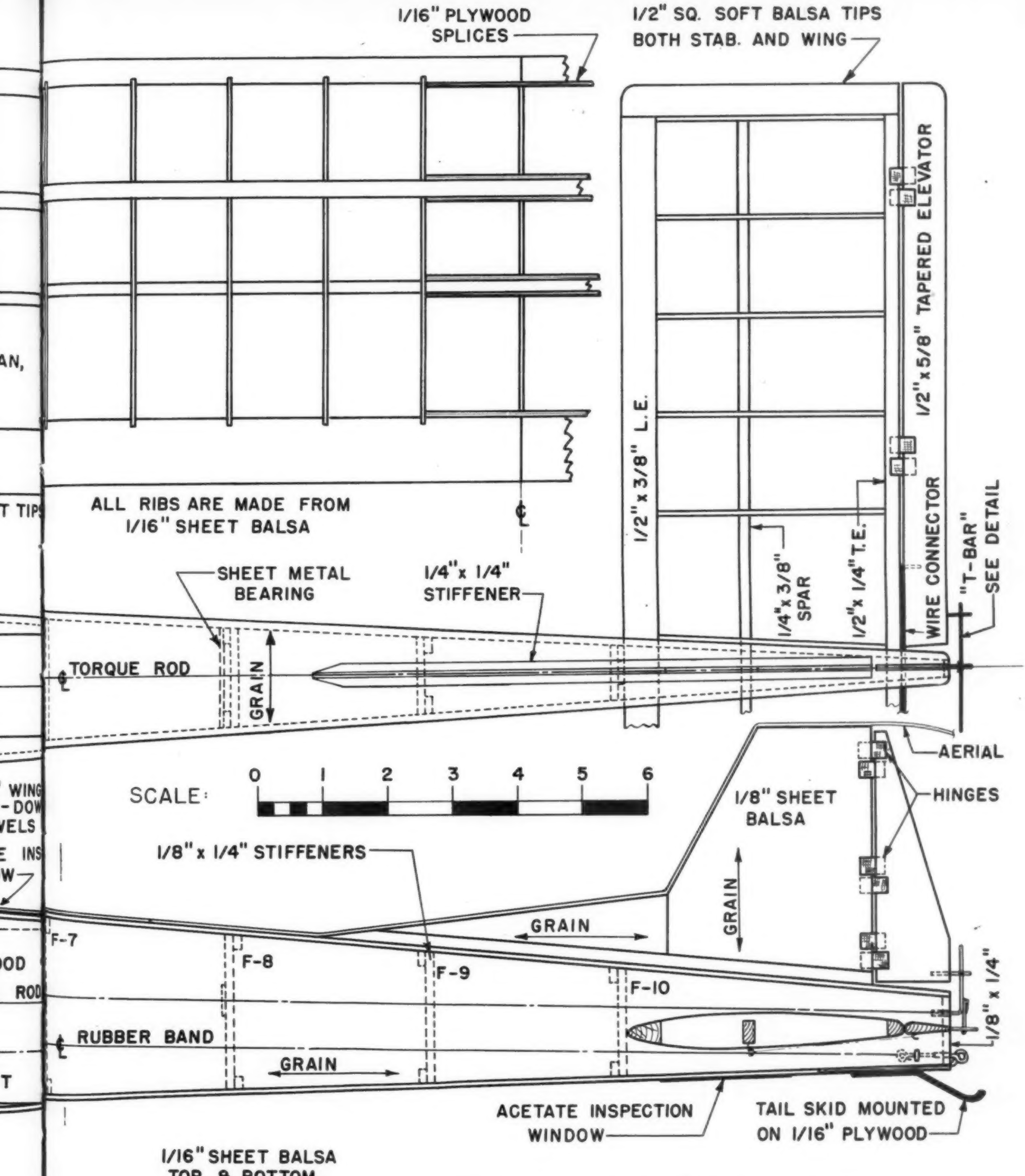


DETAIL OF "T-BAR"





FLYING WEIGHT, 24 OZ.



THE IMPULSE

DESIGNED BY: BILL JOHNKE
DRAWN BY: Jas. Craig

Radio Control News

by E. J. LORENZ

Pleased launcher, Steve Purdoch, gets off Walter Semke's Guillow Beam, with a Lorenz receiver. Beam is reported to be an easy-to-fly, maneuverable airplane and has been powered by everything from Cub Diesel to Cameron .19's.

Remember Yehudi, the man who put out the light in the refrigerator when the door closed? Now he sends signals during a one-man ground check. Plus info and news.

Most of you have used silk for covering your RC's but for really durable covering material, we recommend nylon. There is almost as much difference between nylon and silk as there is between silk and paper and the inherent toughness of nylon will hold the structure together in even severe crashes. Nylon comes in various weights; be sure that you have lightweight nylon—feels but a little heavier than silk—for small and medium sized jobs.

Have had good luck with Diesel power for our RC jobs. No extra batteries for starting, no fuelproofing required, and good throttle control may be had. The McCoy .049 Diesel hauls our 21 oz. 42 in. RC ship up like a homesick angel. The Mills 1.3 cc is excellent and the OK .074 Diesel should prove exceedingly popular this season now that smaller RC models are making a hit in various parts of the country.

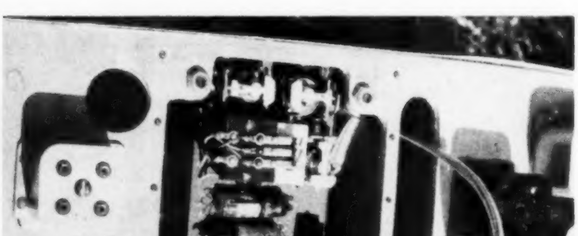
Incidentally, the best Diesel fuel we've ever used is from a formula of Norm Davis of Dansville, N. Y.: 20 per cent ether, 25 per cent No. 70 SAE and 55 per cent kerosine plus 2 per cent amyl nitrate, or approximately 1/4 oz. per pint of mixture. Very little ether and plenty of kerosine makes for extra power, provided the amyl nitrate is used.

Frank Schmidt of Erie, Pa., advises of a simple way to maintain battery potentials, especially on reed equipment. Most receivers operate on either 45 or 67 1/2 volts. Upon placing them in a circuit and applying a load, this voltage will drop from one to three volts. To maintain a full 45 or 67 1/2 volts, or perhaps a few volts more, connect two or three small size pencells in series and place them in series with the regular B battery. Since these cells are much larger than those used in the B batteries, they will last as long as the regular battery and continue to supply the extra punch.

Bill Saks of Washington, D. C., and Frank Schmidt strongly favor shock mounting the engine. Isolating a problem at its source is the most effective treatment, rather than trying to remedy the amplified problem later. By dampening the engine vibration at the firewall, less trouble is encountered with the radio installation, mainly the relay and escapement. Their methods so far have entailed the use of four Lord-type shock mounts to mount the engine and dummy firewall to the actual firewall on the plane itself. Depending on the size of the engine, it is felt that four to eight pound mounts should do the trick. More on this from both gentlemen at a later date!

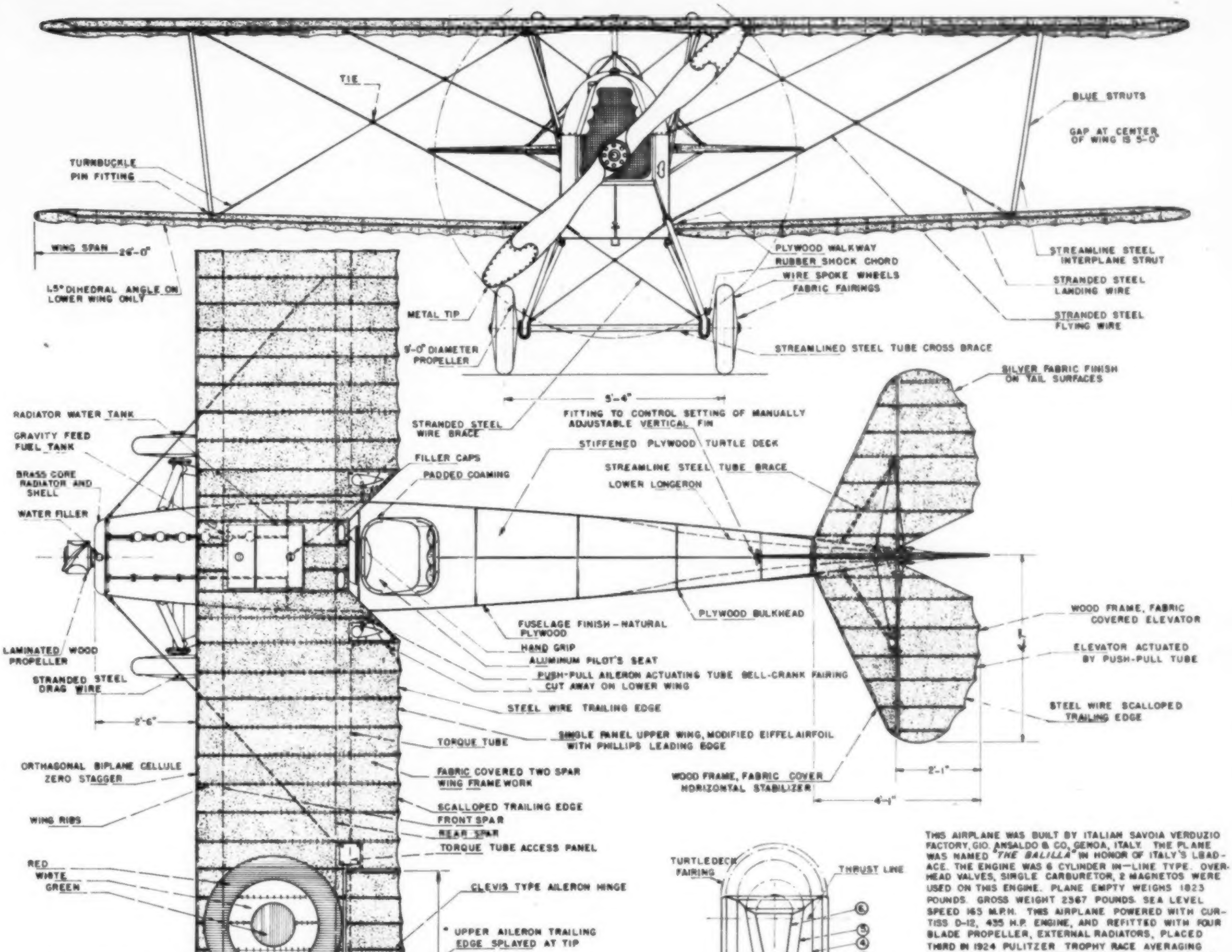
Vernon Macnabb—who also stresses killing vibration at the firewall—asks us to emphasize that relay contact points should never be filed. We have previously pointed this out, and also the reasons for it, but the point cannot be stressed too often as dirty relay contacts are a prime cause of fly-aways. The contacts should be cleaned with a small brush dipped in carbon tet.

A. L. Morgan, whose transistor-receiver was the first in the field (MAN, Oct., 1953), has a solution to the interference problem, especially at contests held at large airfields. By using panoramic equipment, (*Continued on page* 46)



Earl Vivell's receiver: CK-5677 detector, two 1V5's. ED reed bank and Neomatic relays. Battery boxes are plastic, two-piece jobs by Hillcrest.

Live Wire liaison, symmetrical wing stunter with Torp .15 and Schmidt five-channel. Total weight is 3 lb., 13 oz. Note leading edge spolier.



THE ANSALDO SVA-1

W. L. NYE

TESTORS

BUTYRATE DOPE

COVERAGE

Testors Clear Butyrate Dope produces a tough, well sealed surface. Testors Colored Butyrate Dopes produce a solid beautiful surface with one coat.

BRUSHING • SPRAYING

Testors Butyrate Dope brushes and sprays easily without gumming and pulling. Dries to a smooth surface.

GLOSS

Testors Butyrate Dope produces good gloss not usually expected in dopes of such high coverage.

SHRINKAGE

Testors Butyrate Dope has controlled shrinkage designed especially for model airplanes. It will produce taut paper and fabric areas but will not warp wings and fuselages.

TESTOR CHEMICAL COMPA

Hot Fuel Proof!

50¢

QUARTER PINT ONLY (THINNER 35c)

COLORS

Medium Green	True Blue	Silver
Insignia Red	Insignia Blue	Clear
Maroon	Aircraft Gray	Insignia White
Orange Yellow	Olive Drab	Sanding Sealer
International Orange	Gloss Black	

TOUGH • FLEXIBLE

Testors Butyrate Dope produces a tough and flexible film which greatly strengthens the model plane. It will not check or crack even under the most severe conditions.

RUBBING

Testors Butyrate Dope can be rubbed and polished to a "piano" finish.

QUICK DRYING

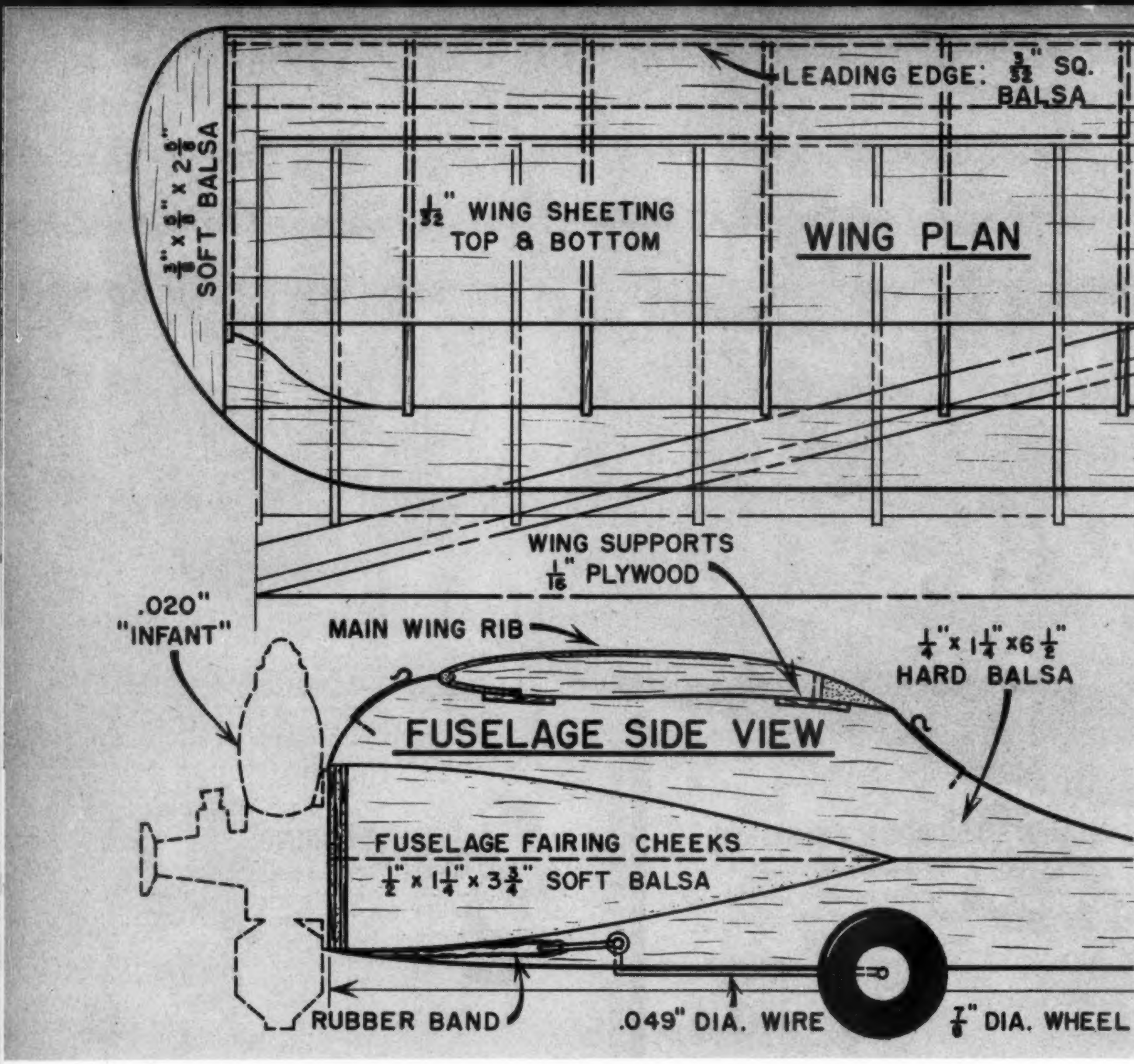
Testors Butyrate Dope is quick drying and blush proof.

COMPLETE FINISHING SYSTEM

Testors Butyrate Dope is available in Clear, Sealer, and twelve popular colors. It forms a complete finishing system and does not require hot fuel proofers.

LOOK FOR THE SELF-SERVICE COUNTER DISPLAY AT YOUR DEALER'S

PAY • ROCKFORD, ILLINOIS



This is a full size plan. For extreme simplicity, with only a slight loss in performance, a sheet balsa wing may be substituted for the built-up

Most tiny free flight sport jobs are meant simply to fly; but Frisky is pugnacious squirt with big ideas; be careful it doesn't climb too high.

FRISKY

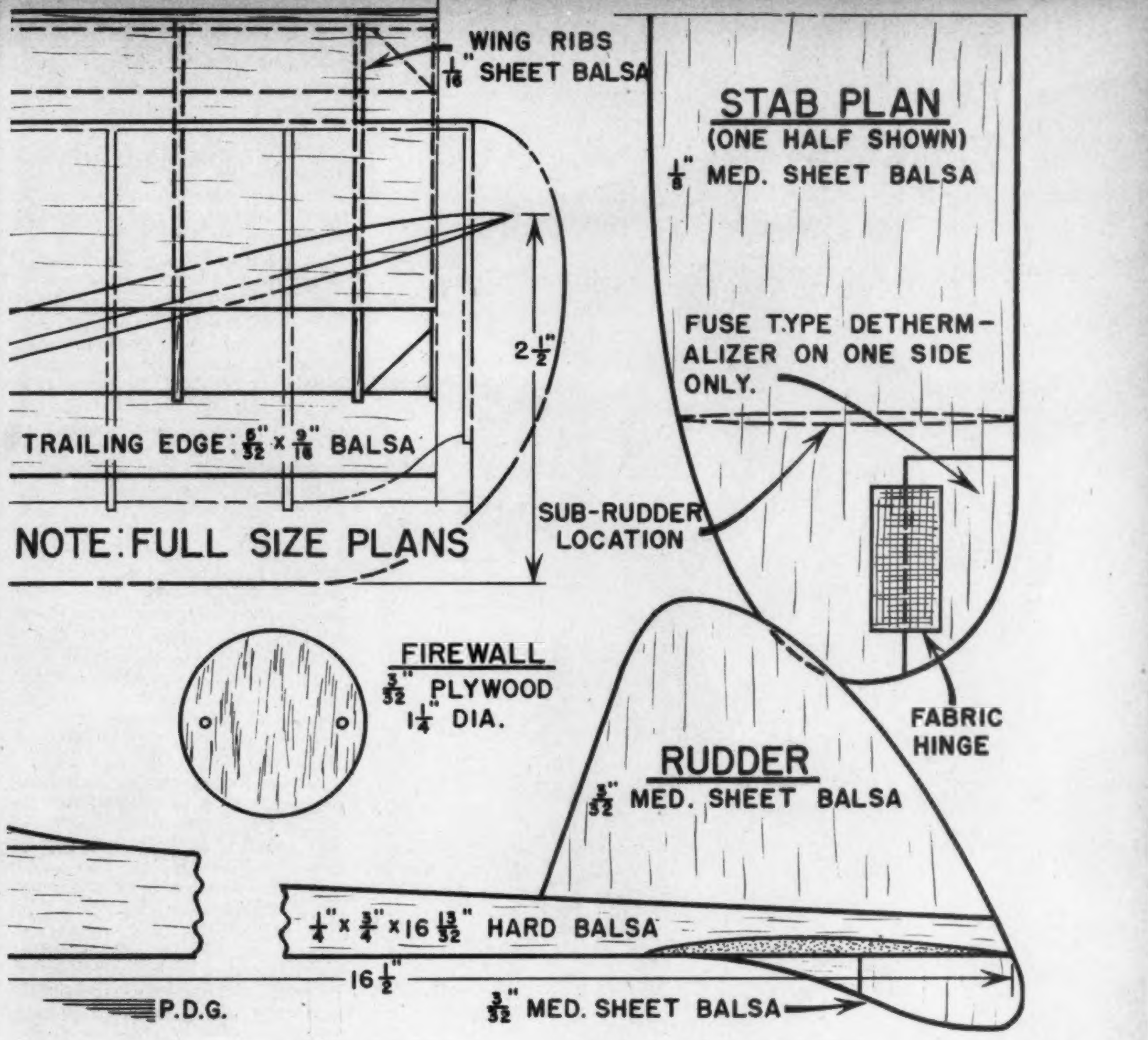
By PAUL E. DEL GATTO

Warning: This midget free flight is footloose.

▶ It isn't often that you can build a high performance midget in a matter of hours, but here is one that fills the bill.

Power is supplied by a K & B Infant. If you have an old Campus CO_2 engine lying around, you might also consider using it.

Since the plans are shown full size, no time is wasted in enlarging the surfaces.



wing shown on the plan. The dethermalizer tab on one side of the stabilizer was rubberband loaded, fuse operated on the original airplane.

FUSELAGE: Cut out the fuselage silhouette from 1/4 in. sheet balsa. This is made from two pieces consisting of hard balsa for the boom section and medium balsa for the wing mount section.

The firewall is cut from 3/32 in. plywood and the holes drilled to receive the engine. Before cementing the firewall in place locate the bolts for fastening the engine in position, from the rear of the firewall.

Next, the soft balsa blocks from which the fuselage side fairings are shaped are cemented lightly in place and shaped to the approximate outline. Upon completion, pry them loose and hollow to approximately a 1/8 in. wall thickness. This will minimize the weight without sacrificing essential structural strength.

To complete the fuselage, cement the 1/16 in. plywood wing supports in place and install the single wheel retracting gear assembly.

WING: The wing on the original model featured the built-up construction on the plan. However, a wing shaped from 3/16 in. medium sheet balsa would also be suitable. Performance may not be comparable with a built-up wing, but the difference will not be great.

Cut out the wing ribs. Then construct either wing panel frame and install the dihedral gussets. The remaining wing panel frame follows and is joined to the previously completed frame.

Wing sheeting and soft balsa tips are then added in that order. When the wing structure is completed, shape and sand smooth to completion. For added strength re-cement all wing joints, particularly around the center section.

TAIL ASSEMBLY: The tail assembly is constructed entirely from sheet balsa. Select the proper grade of balsa and shape-sand to completion the rudder and tail surfaces.

On the stab, cut out the section which is to act as a dethermalizer and fasten to the stabilizer with a piece of silk or cloth fabric. When completed, add all the dethermalizer hooks and also the stop on the bottom which prevents the tension of the rubber from pulling the dethermalizer section below the horizontal. (*Continued on page* 47)

KenHi Wildcat, powered by Fox, is a representative example of stunt kits, engines on the market.

The STUNT Engine

by E. C. MARTIN

Serious fliers find valuable info in this series on tuning special purpose engines for improved results. Good reading for all hands.

The preceding articles in this series have covered fuels, plugs, simple tuning, definitions of power and engine mounting, most of this data being applicable to all types and sizes of engines, and directed toward easier handling and greater awareness of engine operation.

It is now intended to extend and channel this information into the selection and improvement of engines for each of the specific branches of contest activity: namely, stunt, team racing, speed, RC and free flight, and also, though it may seem odd, leisurely sport flying.

The past few years have seen many developments in the engine field, some illogical, several popular but transitory trends, and a few solid and valuable advances in design, all, however, offered as improvements in power output, and almost all embodied in engines which are claimed to be the ultimate in their class for all types of contest activity.

All experienced modelers will agree that such an engine is unobtainable and we will go a step farther and state categorically that it is impossible. An all out racing engine, for example, cannot perform with equal efficiency through the stunt schedule without considerable modification, and, though often used, is highly uneconomical for team racing. The conclusion is that each specialized branch of the hobby has reached the stage of requiring specially designed engines. Our opinion is that special purpose engines would find a ready market because it would be necessary for the modeler to employ the best equipment available in each type of contest in order to stand a chance.

With few exceptions, we do not currently have the ideal engine for each category. Nevertheless, we can modify what is available to give us something nearer what we want, so let's take the stunt model and analyze the power requirements.

A stunt job does not maintain uniform speed, the variation being as much as 75 per cent of its maximum in extreme maneuvers, and since engine speed varies with air speed, the engine must be extremely flexible in its ability to maintain correct mixture strength and power output over a wide rpm range. In advanced maneuvers, circumstances arise where the model virtually hangs on the prop, and only brute pulling power maintains line tension. We therefore need torque in large quantities in the 8,000 - 12,000 rpm range, and under conditions where balanced fuel feed is most hampered. Actually, we want everything, because high bhp at about 15,000 rpm is the requirement for most aerobatics, and the design factors for high torque are in many ways the opposite to those producing high bhp. A good stunt motor must consequently be a careful compromise.

Having decided what we want, let us see how to get it by grouping the relevant design factors under three headings: ignition, carburetion and construction.

The first decision obviously lies with the choice of ignition and since spark is, if nothing else, at a weight disadvantage, the alternatives are Diesel or glow. The latter currently enjoys popularity owing to the wider choice of engines, but this situation will probably change with time. Actually the modern Diesel has several advantages for stunt because of its superior torque and the fact that low bore/stroke ratio makes for high bhp and high torque as well, whereas the glow type gains bhp but loses torque slightly with a short stroke. Furthermore, since a stunt engine usually gets a lot of use, the low cost of fuel and elimination of plugs are factors in favor of the Diesel. However, in all other respects, design considerations are identical, and since glow engines are in general use, let us consider this type.

Carburetion is the key to stuntability, and everyone has seen intakes half-plugged with balsa to increase suction, and are aware that most engines only seem interested in level flight. Suction must be strong and as uniform as possible over a wide range of speed, and the most successful method of insuring this is to arrange for air to pass over the jet at high (*Continued on page* 41)

The Impulse

(Continued from page 23)

fracture and not a single wire or part has been replaced or repaired on the radio or escapement installation.

Out on Long Island, N. Y., where the design originated, the winds are nearly always present to haunt the radio flyer, expert and novice alike. The desire to fly effortlessly in this type of weather was a major factor in the over-all design. The thin high speed airfoil close to the thrust line together with a relatively long-nose moment combines to effect a fast flying model capable of knifing into the strongest of winds without the "ballooning" bugaboo which usually plagues the windy weather flyer.

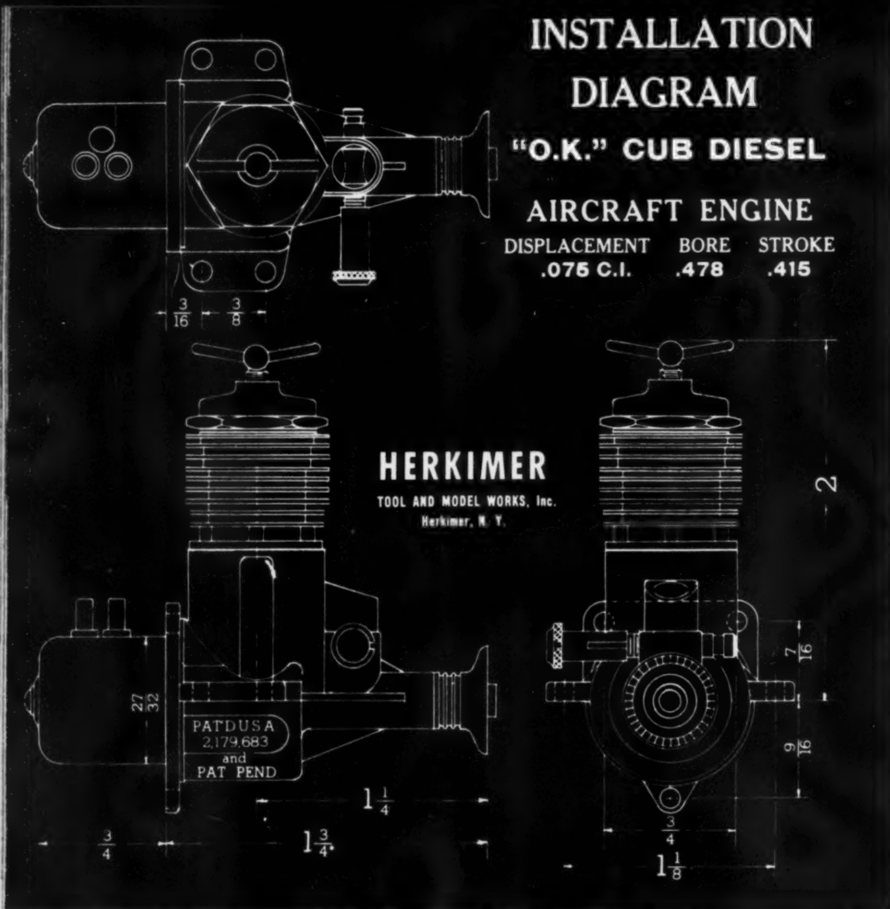
All the principal weight producing items of structure and equipment are concentrated improve the control response in a maneuver by reducing the moment of inertia of the mass of the airplane. When the weighty items are distributed over a large part of any model, it is still possible to equalize the static balance of the ship to arrive at a close to the center of gravity in order to correct CG location, but in actual flight, when the model is in a turn, a spiral, a loop or other dynamic maneuver, the plane, by the wide distribution of its masses, is affected by a greater force (moment of inertia) which requires a longer period of applied control. The end result is often what our British cousins quaintly refer to as a *prang,* complete with splinters. With the Impulse the quickness of control response is one of its greatest assets, under power and glide.

The fuselage has been structurally designed as a beam to withstand the rigors of extensive flying. The fuselage sides in this case act as the flanges on a steel girder, but to attain their maximum strength they must be as free as possible from openings and must be kept from moving together or apart during any period of stress. A steel girder provides for this with a properly designed web and in the Impulse, application of the top and bottom sheeting with the grain running from side to side, rather than lengthwise, accomplishes the same. In this manner a more perfect practice of the principle of beam analysis is possible in model making. This fuselage construction has survived the strains of RC flying far longer than the other conventional methods of building, and approaches prefabrication for speed of assembly.

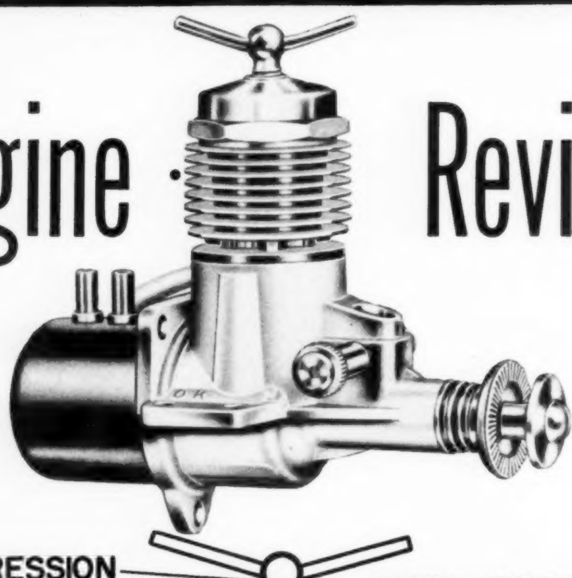
Begin by cutting out the fuselage sides to shape from medium-hard sheet balsa. If your material is 3 in. stock, butt-joint for the additional depth as indicated near the *bottom* of the fuselage. At this time cut out the holes for the spars of the stabilizer as shown cross-hatched on the side view. The stab will be built directly onto the model later. Cement formers F-4, F-5, and F-6 in place while carefully checking the sides for alinement. When this is dry, the rest of the assembly is done in the hand. The tail piece of 1/8 x 1/4 in. is cemented in as is the engine firewall F-1. The location of F-1 is determined by the engine to be installed so that propeller location remains the same. Once again check alinement of the sides. Several examples of the the Impulse have indicated that side thrust or downthrust were unnecessary but each builder may have his pet method of adjustment and the radially mounted engines allow for maximum trim. The fuselage sides have now formed their natural bend without placing any undue strain on them during construction through unnatural bends to achieve arbitrary visual lines.

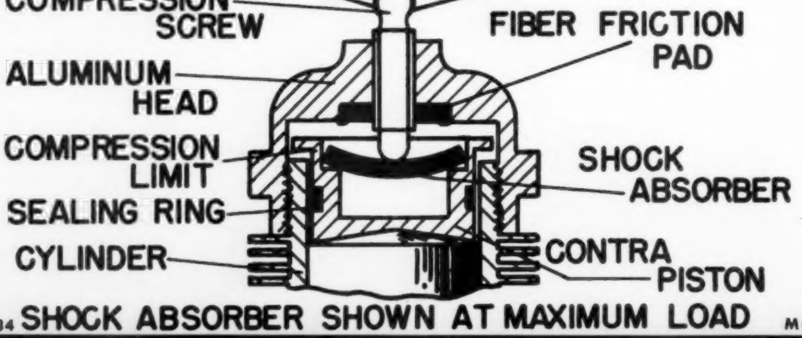
Fuselage stations F-7, 8, 9, and 10 consist of 1/8 x 1/4 in. stiffeners cemented to each side panel and tied together with 1/8 x 1/4 in. struts lap-jointed as shown. Temporarily place three penlite cells for spacing purposes

(Continued on page 35)



Engine · Review





SHOCK ABSORBER SHOWN AT MAXIMUM LOAD

By E. C. MARTIN

Ingenious features make for the excellent performance reported.

O K CUB DIESEL

▶ The entry of the Herkimer Tool & Model Works into the Diesel field is a significant step toward consolidating the Diesel trend, and also provides the vehicle for several interesting design innovations. Anything new from the OK stable is always backed by extremely thorough research and experimentation, and, as might be expected, the new features, along with the Brebeck porting system, are the object of protective patents.

Although closely resembling the glow Cubs in general design and appearance, every component has in actual fact been subjected to exhaustive tests, and, in some cases, extensive redesign, in order to withstand the greatly increased stresses of Diesel operation, and it is with the object of minimizing these stresses that the most interesting of these new features is concerned.

The severest strain in a Diesel occurs at the moment of ignition because, unlike the gasoline engine, which produces a relatively gentle and progressive push on the piston, the Diesel power impulse is virtually a violent detonation of very brief duration, and as a result, when the piston is in the region of top dead center, there is an instant when bearing loadings and consequent friction are tremendous, and it is at this moment that most of the wear and mechanical power losses occur.

Mr. Charles Brebeck, manufacturer of the Cub engines, has long felt concern over this condition, not only in Diesels but, to a somewhat lesser degree, in glow ignition engines, and accordingly has employed a rather unusual method of cylinder retention in one of his older designs, the OK .29. Students of engines may recall that two steel clamps engage with the port belt flange on the .29 and that a relatively thick gasket is employed between the flange and crankcase casting, with the object of utilizing the springiness of the clamps to permit slight axial movement of the cylinder assembly and thus minimize shock at the moment of maximum pressure.

The .075 Diesel carries this line of thinking a stage farther by employing a cylinder rigidly screwed to the crankcase in the normal Cub manner, and a device for absorption of shock between the contra-piston and compression screw.

A glance at Fig. 1 will clarify the operation of (*Continued on page* 45)

The Impulse

(Continued from page 33)

against the forward part of F-4 and cement F-3 (1/16 in. balsa), with grain running side to side, snugly against the batteries to form the front part of that battery box. Form landing gear from 1/8 in. steel wire and make plywood sandwich to contain it as former F-2 to fit between fuselage sides and forward of F-3 just enough to permit a close fit of the "hearing aid" B-supply batteries where shown. Cement in the balsa doublers against the sides and between all formers forward of F-4 to strengthen the nose area and to lock in all major formers.

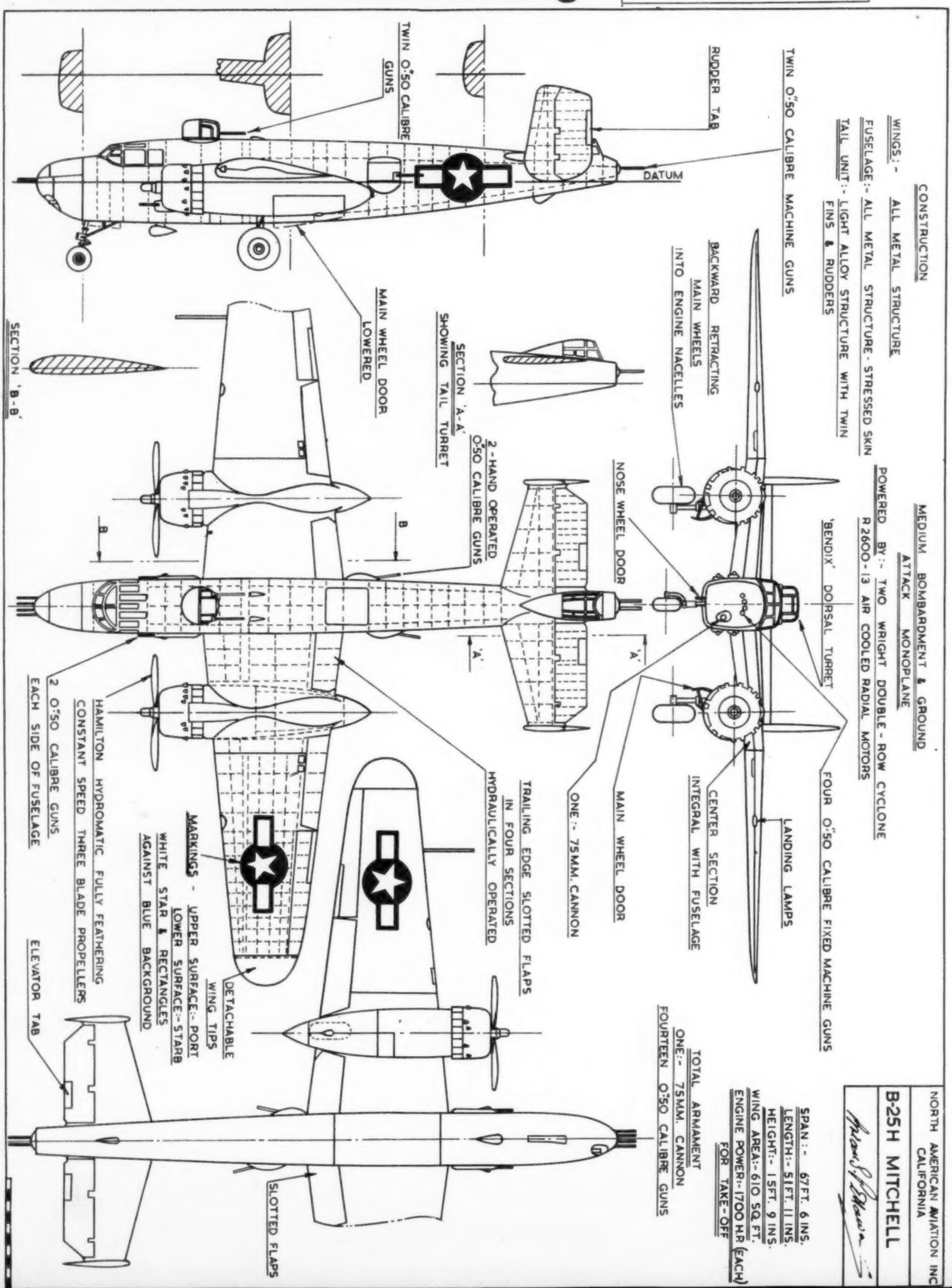
Install the required components for the radio receiver and escapement mechanism. The receivers used in the author's models have been both the Control Master hard-tuber and the standard Super-Aerotrol, each of which can readily be mounted in a small space. By placing the components where indicated on the plans, wiring is kept as short as possible. The five-prong plug and socket are standard Amphenol items available at most radio supply houses. No exposed wires run loosely into the finished receiver compartment. The torque rod of 1/16 in. steel wire is used to absorb the accidental shock of any knocks against the rudder tab, so damage to the escapement is eliminated. Bellcrank systems of linkage tend to throw the full force of an accidental movement of the rudder directly against the sensitive adjustments of the escapement, often leading to annoying damage. Bearings for the rod are located in F-6, F-8 and a small piece of brass tubing in the tail piece. The penlite battery box is finished by filling with balsa on the sides to prevent sideways movement of the cells and cementing in the top of the box, a piece of 1/16 in. plywood having eyelets riveted in place for the top contacts. One penlite cell is used for the A-supply of the radio and two penlite cells for the escapement.

The fuel tank is now installed right behind the firewall, after setting the mounting nuts for the engines to be used. Cement in the 1/8 x 3/8 in. top stiffeners which strengthen the fuselage at the open receiver compartment. Complete all wiring and extend battery connections forward to the battery boxes by snaking the wires one under each of the top fuselage stiffeners and one along each of the lower sides of the receiver compartment to their proper locations.

Install rear escapement winding hook in its brass bushing. Bend this wire to have a closed hook for the rubber and a loop for winding extending into a stop to prevent rotation of the rubber when released against the tail piece. A washer is soldered to the shaft where shown to permit winding of the rubber by hanging the model from the winder and using the washer as a bearing against the brass tube, enabling quick and efficient control over the number of turns desired for each flight. The hook of the escapement proper is also closed to prevent the rubber from snapping off during a hard landing or when hitting an obstruction.

The top and bottom of the fuselage may now be sheeted as previously described, leaving openings for the battery hatch cover, top of the receiver compartment and the rear portion still required for the stab assembly. Note the escapement is completely built in. It has been established that if the escapement is properly set up and adjusted at the beginning and then protected from dust, oil splash, grit and exploring fingers, it will give most dependable performance. If absolutely necessary, a small portion of the top or bottom sheeting can easily be removed and replaced when assembled as mentioned earlier. As an additional precaution against the landing gear spreading away from the fuselage and damaging the sides, a few turns of soft copper wire around each strut at the bottom of the sheet-

Planes Worth Modeling— B-25H MITCHELL



ing will restrain any movement, by tying both struts together.

The stabilizer is assembled by sliding the preformed spars through the holes in the fuselage prepared for them earlier, lining them up properly and cementing in place. The ribs are then slipped over the center spar and cemented where shown. The tips are of soft balsa sanded to shape. Complete the sheeting of the rear part of the fuselage and install rudder as indicated, stiffening it by the two side gussets formed into a triangular cross section from 1/4 x 1/4 in. stock. The antenna wire runs along the top of the fuselage following the contour of the fin as shown. For hard tube receivers, reception can be improved by utilizing a vertical wire whip antenna, to eliminate reflection of the signal by the torque rod, but in gas tube receivers the indicated installation has been found extremely satisfactory.

The battery hatch cover is built as shown and contains a jumper contact across the two escapement cells and a wire connected contact to the radio filament lead. The hearing aid batteries can be fitted with snap contacts by soldering onto the terminals standard battery snap fasteners available for the Minimax type batteries. This enables changing of B-batteries in the field without the need of soldering facilities. Also shown is the oil shield of sheet aluminum which prevents engine exhaust from entering the radio receiver compartment. It is held in place by a loop of rubber stretched from wing peg to wing peg.

The wing construction is just as straightforward as it looks. Beefy leading and trailing edges help prevent warping and flight damage. Silk covering of the flying surfaces is recommended. The dihedral angle is best at 6° or 7° for each panel. For sport flying with lower powered engines the indicated wingspan of 45 in. is ideal but if you want a really hot performing, highly maneuverable contest job, install an .099 engine and reduce the wingspan to 36 in. (you can do this at a later time if desired by merely moving the square tips in three rib spaces). This will give lower lift but at the higher speed it will again be equalized and you will have a model you can throw all over the sky without difficulty. However, if you are a beginner, the best advice is to put in some time at slower training speeds, then when the feel is there you can do the hot rod stuff.

A detailed drawing shows the modification of the standard rudder control linkage which is used to get effective elevator control. The "T" bar, when in neutral, acts as a stop for each of the pins in the elevator surface, which is held down lightly by a rubberband hooked from the underside of the elevator to a hook near the forward part of the underside of the stab proper. Keep this tension as light as possible to prevent overloading the escapement. When either rudder position is signalled, the "T" bar also simultaneously pushes up on the pin on one side causing up-elevator; the opposite rudder position does exactly the same thing but with the other pin. By moving the pins away from or toward the rudder along the trailing edge of the elevator, it is possible to get any desired amount of up control with either rudder position.

The advantages of this system are obvious when given a little thought; the flier can keep the nose of his ship from falling in turns as does a full scale pilot when he applies a bit of back-stick in smooth turns; the model can be spiralled into a dive after about 180-270° of turn and looped with ease by applying alternate pulses of right and left rudder (which will neutralize each other) giving the effect of up-elevator for snappy loops; three point landings are made in a similar manner by alternate pulses as a touch-

(Continued on page 40)

Winners

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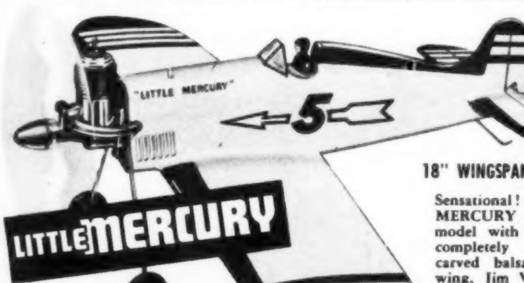

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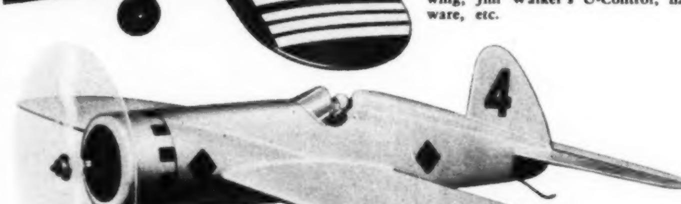

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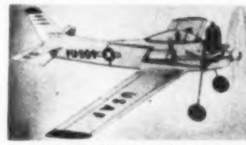
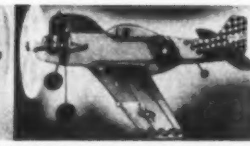

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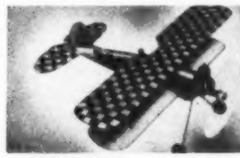
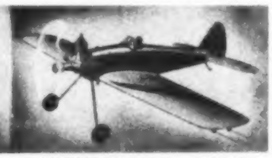
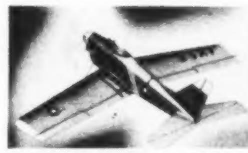


LITTLE BIPE $1.50
SPAN: 16" For .020 to .074 Eng. Carved balsa fuselage bi-plane . . . prefabbed for easy assembly. It's control-line. A real value!



LITTLE DEVIL $1.50
SPAN: 18" For .020 to .074 Eng. An economically priced U-Control model. Prefabbed parts include: formed balsa fuselage & wing, etc.



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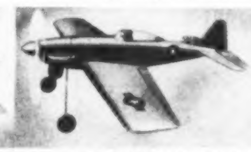

LITTLE MUSTANG $1.95
SPAN: 18" For .020 to .074 Eng. Famous escort fighter model. Completely prefabbed. Features carved balsa fuselage, formed balsa wing, etc., etc.

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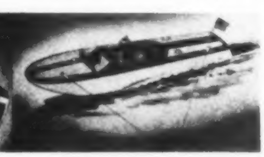
SPAN: 22" For .020 to .074 Eng. A U-Control scale replica of the real plane. Prefabbed model has metal cowl, carved fuselage, etc.

RIVIERA $3.50
For "½ A" Eng., Electric Motors. Authentic Chris-Craft replica with a 12" carved balsa hull and brass metal fittings. All parts finished.



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down nears, flaring out nicely to a soft approach. The application to rolls, stalls, wing-overs and a multitude of other maneuvers is at the disposal of any RC flier using just a simple escapement and any standard receiver. A word of warning for the first flights is in order, though, if you have had no previous experience with this type of elevator control. Start with your elevator movement as small as you can and gradually increase it as you achieve the feel. Keep your batteries fresh and you'll have an airplane which has tremendous performance for a long time to come. END

Last of the Fabulous Hawks

(Continued from page 13)

of the flight circle. Other miscellaneous items, such as gun ports, should be added now.

Before you apply the paint, the entire model should receive at least four coats of Sanding Sealer. More can be brushed on if desired. Sand well after each coat is dry, using fine sandpaper.

Before the cockpit canopy is installed, those portions of the fuselage that will be covered by the celluloid, including the rear view recesses, should be painted silver because these portions were left natural aluminum on the full scale P-36. Use fairly thick celluloid sheet for the canopy, about .008, in order to have it maintain its shape despite constant handling. Cement the celluloid in place, holding with pins until dry.

The prototype model was colored to agree with the camouflage used by the famous 27th Pursuit Squadron (Diving Hawk). During the years immediately preceding World War II, many countries were experimenting with several forms of deceptive or "dazzle" camouflage. Britain used diagonal yellow and blue stripes while Germany tried red, yellow and blue zig-zag patches. The U.S. covered the entire plane with white, green and orange patches on both upper and lower surfaces, as the photographs illustrate. It is suggested that the entire plane be first colored white. Four coats should suffice. Using fresh masking tape, mask off the white areas and apply the orange dope. Care need not be taken to keep the orange from overlapping the future green areas. When this is dry, mask off the orange areas and apply dark green dope onto the remaining unpainted portions. Leader's stripes are optional. These reverse color when they pass from one color patch onto another. For example: the stripe is orange on a green patch but changes to green when it crosses onto an orange patch. This is painted on after the area is well masked. A careful application of rubbing compound will enhance the finish.

It is interesting to note that no national insignia was used. Only squadron insignia and element number were used as a means of identification. These can be cut from "Trim-Film" decals.

Add the wheels, antennae, wing guns and pitot tube at this time. Carefully cut the engine hatch and fuelproof the entire cowl interior with several coats of clear fuelproofer. Install the engine and replace the hatch, using a few droplets of fuelproof cement to hold the hatch in place. The entire plane should now receive two coats of clear fuelproofer.

Your handiwork must balance as shown before any flying is attempted. Flight lines of from 25 to 40 ft. long can be used for .14 in. engine installations while 30 to 60 ft. lines can be fitted to the models with heavier engines. Use steel .008 in. flight lines for the smaller engines and at least .010 to .012 in. for those of larger displacement. Always fly from smoothly paved surfaces such as school yards (on week-ends), parking lots, etc., for the model's safety and added realism. END

The Stunt Engine

(*Continued from page* 32)

velocity. This demands a rather smaller intake cross sectional area than desirable for maximum bhp, but a far better solution than plugging half the intake is to increase its length considerably, possibly by as much as 2 in., and thus still maintain the breathing capacity of the engine.

The long intake channels the air in a definite direction and brings it to induction velocity sooner than would a short intake, with the result that the air gains momentum and tends to keep moving during the time the inlet port is closed, and therefore does not have to be accelerated to the same degree when the port opens. Since it is the flow of air over the jet spraybar, and not crankcase suction, which draws fuel from the tank, there is a slight gain in power which largely offsets the losses of a small diameter intake, but more important, the more continuous flow of air produces a more continuous flow of fuel from the jet, especially at low engine speeds, where there is a greater tendency for fuel to arrive at the jet in pulses, with consequent time lag and mixture variations. This simple modification is well worth the trouble, and may be accomplished with a piece of aluminum tube emeried to a good fit in the existing intake and drilled to receive the spraybar, which, by passing through both intake and tube, will lock the latter in position. The bore of the tube may be progressively drilled larger, in the light of experiment, to determine the best diameter for the particular engine. In regard to length, it is generally most convenient to bring it level with the cylinder head in the case of a front rotary engine.

Incidentally, you can with advantage direct the mouth of this intake into the slipstream. The resulting pressure will tend to increase the intake air velocity. However, it should be appreciated that only the directional qualities of the long tube make this advantageous, whereas undirected pressure in a short intake will often tend to drive the fuel back to the tank rather than suck it out.

Another factor controlling suction is port timing, particularly that of the inlet valve. Since our stunt engine has to exert powerful suction over a wide range of speeds, we cannot afford the negative suction or blowback produced by high speed timing when operating at low speeds. With all forms of rotary valve, it is therefore necessary to time for maximum efficiency in the lower speed range and sacrifice high speed performance in the interests of reliable carburetion. This means that the inlet port will close 10 or 15° after top dead center, instead of the usual 40 or 45°, but in the case of a shaft valve motor, there is very little the amateur can do to reset the timing, and the only alternative is to choose a motor that does feature a minimum of overlap beyond TDC, such as the Fox.

The real answer to timing efficiency for stunt is the reed valve as featured in the Space Bug, which times itself to the demands of the engine, regardless of rpm, but unfortunately this is not currently available on any larger motors. The rabid enthusiast, however, will not find it excessively difficult to rework a crankcase backplate and make his own reed valve and carburetor, subsequently, of course, blocking off the original rotary intake. (*The reader is referred to Engine Review: Space Bug, MAN—5/53—The Editor.*) It should be appreciated that there is no objection to large ports; in fact, the larger the better, but the desirable timing usually demands shallow bypass and exhaust openings in order to extract all possible energy from the gases before release, and thus produce maximum torque. The port area must therefore be derived from width.

There is one fairly common method of providing high induction velocity and at the same time maintaining good high speed breathing qualities, known as sub-piston supplementary induction. This system features a small bore intake for good suction, and either extra ports in the cylinder wall which are uncovered by the piston skirt at TDC, or a short piston skirt which partially opens the exhaust port at TDC. Extra air, unmixed with fuel, is therefore induced into the top of the crankcase and supplements the normal charge. Typical examples may be found among the notably powerful engines, such as certain McCoy models, the old Super Cyke and Anderson Spitfire .60.

Obviously, the opening of these ports must reduce suction at the carburetor, and also increase the tendency toward uneven fuel air mixture, but this does not become apparent in level flight. In aerobatics, however, we can positively state that sub-piston induction aggravates carburetion problems and is therefore not desirable in a special stunt motor.

Jet location is important because it is necessary for the center line of the fuel tank to coincide with that of the jet in level flight, in order to have an identical head of fuel when inverted. If the jet happened to be situated beside the cylinder head, for example, an odd fuselage design would be required to accommodate the tank. An ideal tank mounting is provided by the engine bearers which favors a jet position as close to the crankshaft as possible.

The points which come under the heading of "construction" are straightforward. Stunt models show an unpleasant affinity for mother earth, and mounting lugs, crankshafts and crankcases should be designed accordingly. Stunt engines probably get more continuous running than any other type, and bearing dimensions and materials should be selected with this in mind. Ball bearings and well fitted piston rings could really pay off in this type of engine. However we only want weight that pays for itself, and racing engine ruggedness is not necessary to the moderate output dictated by our carburetion requirements, while at the same time, the ground is very hard. Finally, the needle valve should be in a protected position and feature large diameter threads to obviate breakages.

The purpose of all this verbiage is to crystallize the requirements of a stunt engine and explain the design features which give us those requirements and why. You cannot buy the ideal engine, but you can buy one which comes fairly close, and with a little ingenuity, build into it the remaining features —and enjoy the satisfaction of having done it.

END

Scale Modeling

(*Continued from page* 21)

type models can be turned out. Along with know-how of power tools and fine hand tools, such as those used by watchmakers and even dentist and surgeons, you must have a liking for research on every job you do. Ferret out the little known details and facts of a particular plane and use them. Don't just build a model of an airplane. Try to reproduce in miniature every detail of the plane in brass, copper, stainless steel or rust-proofed ferrous metals, and where wood is used, in maple, birch, or white holly. Forget you ever heard of balsa wood and razor blades, for this time you want a job that will stand up in warm glass cases without cracking. Some experience in hand forming of metals and making your own hammers and dies is a great help. So is practical aircraft pattern development.

In figuring out your details, descriptive and analytical geometry and trigonometry are essential. Sure, you can skip around tough layout problems by graphical methods, but you can do more accurate work and save hours of time by using the above "tools."

For example, take a typical World War I landing gear. The front brace goes backward and out at the same time for a given distance. But to find the true length of the front brace you have to find the diagonal of two right triangles.

Take a side view of the plane and drop a normal from the brace fitting at the lower longeron. This gives you the hypotenuse and base of a triangle. Now draw a 90° line from the base, intersecting the hypotenuse or brace at the axle point, completing one triangle. Check the front view of the ship and draw a 90° line from the brace attachment point at the fuselage to the axle. This will give you another right triangle. Now the above mentioned hypotenuse becomes the base or side adjacent for the last triangle. The side opposite is the short distance from the 90° line projected from the lower longeron in the front view of the chassis. The angle then is:

$$\frac{\text{Side Opposite}}{\text{Side Adjacent}} = \text{Tangent}$$

Knowing the angle then, to find the exact length of the front brace mentioned simply multiply the side adjacent by the secant of the angle. See diagram. Really, this is much easier than it at first seems if you have trig tables handy. See Fig. 1.

In Fig. 2 is an essential tool, a fiber hammer you can easily make. After a little practice on soft copper or aluminum you will be surprised at the number of jobs it can do. You will in some cases need a small fiber "Draw Bar" as shown. Fiber for the hammer should cost about 40¢, and for the "Draw Bar," about 25¢. For the hammer handle choose a ball-peen hammer handle about 10 in. long. This runs about 20¢.

See Fig. 3 for a practical example of making a simple cowl over a hard wood form block. While a better way is to spin one out in a lathe, hand forming is an art you can and should easily master. When the copper seems to get too hard, anneal it with small blow torch, let cool and resume hammering. Light taps will remove bumps from preliminary hitting and your trim line can be made with a surface gauge set on a piece of scrap plate glass. Locate cowl center with hermaphrodite calipers or center head. Center punch exact center and, setting regular calipers to desired radius, scribe cowl opening. Clamp the cowl in wood clamps and, using a fly cutter in a drill press, carefully cut opening. If you have no fly cutter, drill a series of holes inside the scribed cowl opening until a circle of holes with very little metal between them is obtained. Now, using a small round file or diagonal wire cutters, cut away the center and file to scribe line with half round file. Cut away the excess metal to trim line with medium jeweler's saw blade, file to exact line and finish with emery cloth and steel wool.

There are many ways to fasten the cowl to the firewall, but I prefer the simple method shown. In Fig. 4 is a strong, easy way to solder wing struts and landing gear in place. Incidentally, don't buy a cheap electric soldering iron. You will need at least two or three sizes ranging from a small pencil type iron to a good sized one. For very light wire and delicate metal assemblies, a pencil type iron is a "must." Next a 60 to 75 watt size and lastly, a 400 to 500 watt size.

In soldering on models, *do not* use a rosin core solder. Tin each joint before soldering and if you can get it, use bar 50-50 solder with a ruby fluid soldering acid. It costs a quarter a bottle. If 50-50 is not available, 60-40 is okay, but not quite as strong as the harder 50-50 bar.

Flat wire .006 x .026, and .024 x 0.100, .062 square wire can be had by writing manufacturers of shoe machinery. This is soft iron wire that has many uses. The square wire is essential in making early fuselage and outrigger frames especially. This wire comes in rolls only but is not hard to straighten out.

The flat wire is used for forming ribs and other framework. For streamlining wire, a flat wire of suitable size can be filed to a 1 in. taper and using very strong pliers, such as the vise grip or a similar type, pull needed lengths of it through an oval wire die held in a vise. This will straighten and strain harden the wire as well. Finish smooth with fine emery cloth.

The oval wire die is a hard steel plate having oval holes from 1/64 x 3/64 x 1/8 in. and can be had from a jeweler's tool supply house.

An assortment of fine jeweler's files of the Swiss Pattern variety is a "must." Round, square, flat, half round, and oval files are available in very small sizes. Use care in handling them and they will last a long time. Die sinkers or riffler files are needed for some operations and these can be both small and medium size. Regular files in round, half round and flat shapes from 4 to 12 in. are needed and a couple of double cut vixens will save you hours of time in squaring up blocks of brass, bronze, or mild steel.

For small drills, an inexpensive pin vise is needed. This should be the smallest made. Its range is from zero to about .050 in. By being careful you can slip a fine drill in this tool and put it in a regular drill press using a low speed and light pull on this brass, steel, etc.

Very fine drilling can best be done in a jeweler's drill press or jeweler's lathe, using a foot rheostat to control the motor speed. Here, experience is your only teacher, so don't be discouraged if you break a few small drills at first. Just take it easy, and *never* force a drill of any size. For all round work, it is far cheaper in the long run to buy high speed drills than to fool with the cheaper carbon bits. Incidentally, a good center punch can easily be made from a worn out rat tail file. Break off a 3 in. length and using a fine cut wheel in a grinding head, grind a point of about 100° included angle. Flatten and bevel the broken end and you have a better one than you can buy. In fine model work a very useful item is a 4 in. magnifying glass on a stand that will enable you to swing it over your work. Devise your own stand or use the idea outlined in this article.

Study a handbook for lathes for data on making cutter bits. A cutter bit for cutting cooling fins on dummy engine cylinders is shown. This is for use on brass or aluminum alloy rod. Large size aircraft rivets can be made into engine cylinders, depending on the scale used. You need a good 1 in. micrometer and a depth "mike" is a handy item at times.

Whenever possible use a decimal scale graduated in either fiftieths or hundredths of an inch. You will gain in accuracy and time saved both in the layout and actual making of parts. A jeweler's saw, resembling a hack saw, but having good blade clamps and a good tensioning device, is indispensable. I prefer a Swiss make as the frame is very rugged and easier to adjust. With it, an assortment of various sizes of jeweler's saw blades are required. Some of these blades have teeth so fine you can hardly feel them, yet they will cut quarter-inch steel. In using this saw, use a light pressure and both hands as you would an ordinary hack saw. Metal rod and sheet are easily cut with these saws.

Ask your dentist for some old dental burrs. He usually discards these and they are fine for cutting grooves or shaping wood, metal and plastics. Use them in the chuck of a high speed motor grinder like the "Handee" or similar make. These little cutters are straight, tapered and ball shaped and run from the size of a pin to about 3/32 in. The trick of making spoke wheels for early and World War I aircraft is shown.

(To be continued)

OK Cub Diesel

(*Continued from page* 34)

the system. In effect, the spring steel pad flexes slightly under maximum pressure and therefore relieves impact on the bearings. As the pressure drops with downward travel of the piston, the energy absorbed by the spring steel is then released and the pad resumes its normal shape.

The illustration also shows how provision is made for limiting the travel of the contra piston, and therefore maximum obtainable compression ratio, by the use of a lip on the upper rim of this component which bears on the rim of the cylinder at the highest desirable compression setting. There is no doubt that this arrangement considerably reduces the danger of overloading the bearings, but as Diesel users know, the damage can also be caused by running a too lean mixture, by using a low grade of lubricating oil, or from the use of a too high proportion of accelerator such as amyl nitrate. By rigidly adhering to the recommended fuel, at least two of these possibilities are eliminated, and common sense should take care of the third.

Sealing of the contra piston is insured not only by an excellent fit, but also by a plastic sealing ring which is recessed into a peripheral groove in the skirt. Friction for preserving compression screw settings is provided by a fiber washer swaged into the aluminum head, and the use of a very fine compression screw thread further reduces any tendency to back off under the influence of vibration and also simplifies smooth adjustment. The usual precautions should still be observed against the possibility of a hydraulic lock, as the various safety devices cannot offset the effects of serious flooding.

The practice normally followed by Diesel designers for avoiding bearing shock is to utilize a conrod material that compresses and flexes slightly under impact, such as forged or rolled aluminum alloy. However, in the new Cub, the shock absorber obviates this need and a heat treated steel rod is used which is conducive to longer bearing life.

The efficiency of the shock absorber also permits the use of a thinner crankshaft wall thickness and a correspondingly larger gas passage than normal. However, the squared crankshaft port as featured in the glow Cubs is modified to an oval shape in this engine in order to increase shaft stiffness, but it is unlikely to reduce over-all efficiency as the power curve peak naturally occurs at lower rpm than usual with the glow engines.

Apart from the foregoing, the new Diesel features standard Cub construction with a polished pressure die cast aluminum crankcase with four point beam and three point radial mounting, integral air intake with pressed-in brass spraybar, screwed aluminum crankcase cover with overlapping gasket for rear mounted tank seating, and split female threads retaining the cylinder barrel. Mixture is conveyed to the Brebeck porting system via two passages milled into the threads, and the flange joint sealed by a soft copper gasket.

Cylinder design is typical with three radial exhaust ports of normal size, and interposed bypass ports, integral fins and blued finish. The cylinder head threads, however, differ from the glow arrangement in that they are external, with the head screwing over them as shown in the illustration.

Piston design is unchanged with a conical crown, case hardened and centerless ground finish, and a pressed-in wrist pin knurled at one end.

The large capacity fuel tank is an aluminum pressing, anodized red, and retained by a central tie bolt screwing into the crankcase cover with a small fiber gasket at the bolt head. Two brass vents 5/16 in. long are situated close to the feed pipe location on top of the tank, and the whole unit may be

rotated for controlline purposes.

A 5/16 in. long aluminum prop driver is pressed onto splines on the crankshaft, and a small projecting insert fitted for prop centering. A washer and screw engaging in the tapped crankshaft retain the prop. A standard Cub needle and control knob complete the engine.

Pleasing features of the new Cub are the nickel plated compression screw which can be manipulated without discomfort from heat and has exactly the right amount of turning resistance; and also the extraordinary smooth running attributable to the shock absorber. However, if one wishes to be really critical, the extra height occasioned by this component could be a disadvantage in scale model installations.

Starting and running behavior on all sizes of prop, hot or cold, is delightful, and there is no reason for the complete novice having any difficulty if the comprehensive instruction sheet is followed. A point to bear in mind for those who prefer their own fuel mixtures is that the makers recommend the use of SAE-70 oil with this engine, to the extent of roughly one third of the total. A thinner oil will not improve performance, nor will the use of more than 2 per cent of amyl nitrate. Without amyl nitrate high speeds cannot be reached owing to the compression limit device preventing a high enough compression setting.

In conclusion, the new Cub is a really hot performer for its size and although we have no figures for a glow engine of similar displacement, its showing in comparison with popular .09 engines assures it wide popularity.

TEST: Herkimer OK Cub .075 Diesel

Fuel: 30 per cent SAE-70 Shell Oil, 40 per cent Shell Diesel Fuel Oil, 28.5 per cent Ether, 1.5 per cent Amyl Nitrate; Running Time Prior to Test: 1 hour; Bore: .478 in.; Stroke: .415 in.; Weight: 2.1 oz. (with tank).

Power Prop	*RPM*
7 x 6	11,900
7 x 4	13,100
6 x 5	13,000
6 x 4	14,100
6 x 3	16,000
10 x 6	7,000
Top Flite	
8 x 4	8,000
6 x 5	12,800
6 x 4	13,900

Note: Exceptional low speed torque and smoothness on 10 x 6.

THE END

Radio Control News

(*Continued from page* 26)

attached to a regular communications receiver, the operator can visually monitor 500 kc each side of the frequency to which the receiver is tuned. A cathode ray tube in the panoramic equipment makes it possible to ascertain what type of interference is present. An excellent idea for the '54 Nats.

We receive many inquiries from fellows who want to get into RC, but who are puzzled about what equipment to select. Probably the best way to make a decision is by getting to as many radio events as possible and talking it over with participants. Naturally, as in anything else, there will be differences of opinion and quite often in various localities one particular set will emerge as the favorite in that area, but repeated observation of many sets will soon prove to an interested person which sets are the most reliable and least complicated. For the novice, we wholeheartedly recommend a ready-built unit by a manufacturer who has established a reputation in the field, and this applies to those of you especially who are unable to secure units locally and must order directly from the factory. In this way the beginner will have a unit that has proved its worth and is guaranteed by the manufacturer.

CLUB NEWS

While most of the country is snowed under and modelers are busy building for the coming season, club news is a bit scanty. However, we did hear of a contest in Albuquerque, N. M., back in October, in which E. L. Safford took top awards in one division for the most controls and pattern flying. Mr. Safford, whose article on a modified Good Brothers Receiver appeared in MAN in June, 1950, flew an Ohlsson .23 powered Sailplane using original radio equipment. A novel event comprised of a speed dash and a duration flight was won by J. P. Taylor. His plane was of his own design, powered by an Elfin .09 and using a Lorenz Receiver. Captain O. A. Strickland took second and third place events with his Mac .29 powered Rudder Bug and Babcock radio equipment. This reporting was from W. C. Hanson of International Models in Albuquerque and the contest was sponsored by the El Paso RC Club and held at Fort Bliss in El Paso.

A scheme for local clubs to add cash to the kitty is to do a little aerial advertising. By this we mean putting on an "airshow" at local gatherings by flying RC jobs with trailing banners or other appropriate sponsor markings. A 5 or 6 ft. ship is capable of trailing a 12 x 36 or 48 in. banner of silk, painted with the sponsor's name. We'd be interested in hearing from anyone who has used this sort of scheme or any other employing RC flying for promotional purposes.

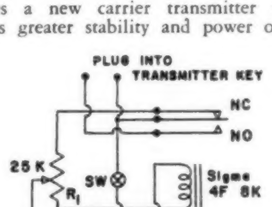
NEW ITEMS

Z. N. Motors, Ltd. of 904 Harrow Rd., Willesden, London N. W. 10, has what appears to be the answer to a good reliable wheel for RC use. In sizes from 2 1/2 in. diameter at 2 oz. to 6 in. diameter at 6 1/2 oz., these wheels surpass in quality any we've seen for a long, long time. We suggest you obtain prices and other details from the London address until such time as an enterprising dealer imports them into this country.

The new Acme battery boxes for 22 1/2 volts (412's and U15's) are a welcome addition to the RC accessory field. No more poor battery connections! The two sizes, one accommodating two batteries for 45v and the other three batteries for 67 1/2v, are well made, and are available at moderate prices through your local dealer or Acme Model Engineering Co., 8120 Seventh Ave., Brooklyn 9, N. Y.

Polk's Model Craft Hobbies now has a new three-channel audio unit by E. D. featuring a printed circuit transmitter. Ground range is exceptional and tuning on both receiver and transmitter is held to a minimum. Either escapement or electric motor drive can be actuated by the receiver. Polk's also an-

nounces a new carrier transmitter which features greater stability and power output.



TECHNICAL TOPICS

How many times have you desired to check your receiver or transmitter, but for lack of an assistant have had to give up the idea? Here is a little gadget we've cooked up to help you out of this predicament. Many pulsing units have been made but this one seems to be the best adapted to the need of turning a transmitter on and off for testing. This unit was made from odds and ends usually found around the workshop of the RC fan.

This is not a construction article, but since there is nothing critical about the circuit, you should have no trouble with it. Build it into a small box which can be plugged directly into the keying cable plug. Basically, then, we have a pulser which allows the transmitter to be turned on for about two seconds and off about one-half second, using 60 mfd at C. Increasing this capacitor to 80 or 100 mfd will turn the transmitter on for about three to four seconds and off about one-half to two seconds, giving ample time for tuning. Control R-1 governs the "ON" time and control R-2 governs the "OFF" time for the transmitter. Varying the position, or setting, of the two controls will produce various ON-OFF combinations. Now you can check your receiver and transmitter without assistance and also be assured of a uniform keying of the transmitter. Incidentally, adjust the Sigma 4F relay to pull in at 1 to 1.2 ma. When the transmitter and relay are OFF, the current is zero. END

FRISKY

(*Continued from page* 31)

COVERING AND FINISH: If you adhere to the built-up type of wing structure, you will have a small covering job to do. Use tissue for covering. However, if this isn't available locally, use a light grade of Silkspan. Use three to four coats of thinned down fuelproof clear dope and sand lightly with 8-10 to 10-0 sandpaper between each coat.

FLYING: A model as small as this one is much less susceptible to damage during testing. From a newcomer's point of view, this is highly desirable as it affords him a better opportunity to get the model properly adjusted without suffering extensive damage.

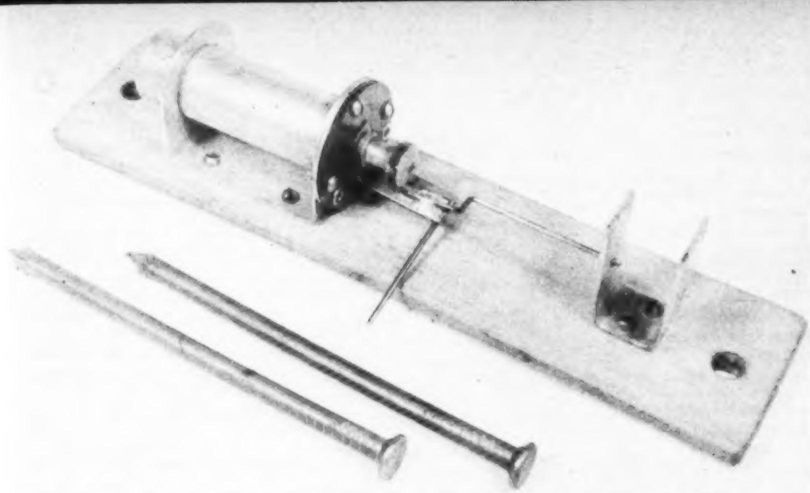
Test glide the model until you obtain a desirable nose-up tendency combined with a shallow turn to the right. These preliminary adjustments can be made by warping the stab up or down, or by altering the wing angle of incidence. Rudder trim should be used sparingly so as not to encourage excessive spiraling or a possible spin.

For the first few power flights, test the model with the prop on backward or enrich the mixture to reduce the rpm. This will provide ample opportunity to observe flaws in the climb which might arise if the power were being utilized to maximum advantage. With each power flight make small adjustments until model is trimmed. END

Pen Pals

In helping handicapped children learn the modeling hobby, James Dallas of 908 DeKalb Ave., Brooklyn 21, N. Y., needs a Campus-A-100 (CO-2) engine . . . Paul Plecan has a quantity of full size plans of gas models formerly put out by Aircraft Plan Co. for sale at reduced cost. For information write to him at 87 Lantern Ave., Levittown, L. I., N. Y.... Looking for Pen Pals to swap views and stuff? So are the following: Wm. Sayers, 150 Pakington St., Gutong West, Victoria, Australia, 28-year-old scale fan... L. A. Bent, 33 Girton Crescent, Geelong West, Victoria, Australia, CL and RC... C. M. Milford, 18 Allandale Crescent, Potters Bar, Middlesex, England, who does engine research... From the RAF, aged 21, J. S. Cowley, 4036619 SAC, HUT-E3, Y-Flight, RAF Heany, Bulowayo, Southern Rhodesia... George Veteto, Jr., Hebbronville, Tex., aged 14... Ronnie Spinks, RR 2, Crooksville, Ohio... Desmond McAnelly, 125 Bluff Rd., Invercargill, Southland, New Zealand, ages 22-25, FF, CL, RC ... B. Tilney, Westview, Widmer End, High Wycombe, Bucks, England, aged 27, CL stunt... Peter Båston, 40 Desborough Park, Maidenhead, Berks., England, aged 15*... Paul Peifer, 24-A Hamburg-Harburg, Stader Str. 274-II, Germany, RC... McCoy .36 Sportsman and old style Forster .301 offered for two Fox, Veco or new model K & B engines by Wm. Dahlgren, 9356 Harper Ave., Chicago 19, Ill.... Peter A. Leonardis, 36 New St., East Orange, N. J., will sell new Mills .08 Diesel and three OK Cubs .074; seeks Australian or New Zealand pen pal... Harry Gabler, Jr., 814 Fifth St., Weirton, W. Va., wants GHQ, Cobra .45, Brown .60 or Ken .60, Avion Mercury, and McCoy .09 for which he'll trade Thor, O & R .60, Allbon Dart .033, Drone Diesel, Spitzy .045 and OK .049 ... R. B. (Smokey) Brogran, Acton Guest House, Canberra ACT, Australia, will exchange English and Australian modeling goods for American... Jim Paul, aged 14, 1417 Warder St., Springfield, Ohio, will trade American engines for English... Berkeley Cessna L-19, Bird Dog, YL-24 offered in exchange by Daniel C. King, 27 Lower Common South, Putney, London, S. W. 15, England... Mike Keville, 197 Burrwood Ave., Collingswood, N. J., will swap new Fox .29 for good K & B .19... David I. Chrestenson, 610 Second Ave., Aurora, Ill., will purchase a Campus-A-100... James McLaren, 1104 Koohoo St., Lanikai, Hawaii, will sell Fox .35 for $11... Thomas Fitzgerald, 36 Upper Rathmines Rd., Dublin, Ireland, will trade British goods for Cub .14, Torp .19 and Walker Pressure Tank. END

English Mercury Models, Aeronca, spans 65½ in.



When timer pulls in, pin pulls out of U-angle at right, releasing loop on plane skid for take-off. Two large nails drive through holes either end of base into ground to hold stooge in position.

FLY ALONE AND LIKE IT

By CHUCK MONROE

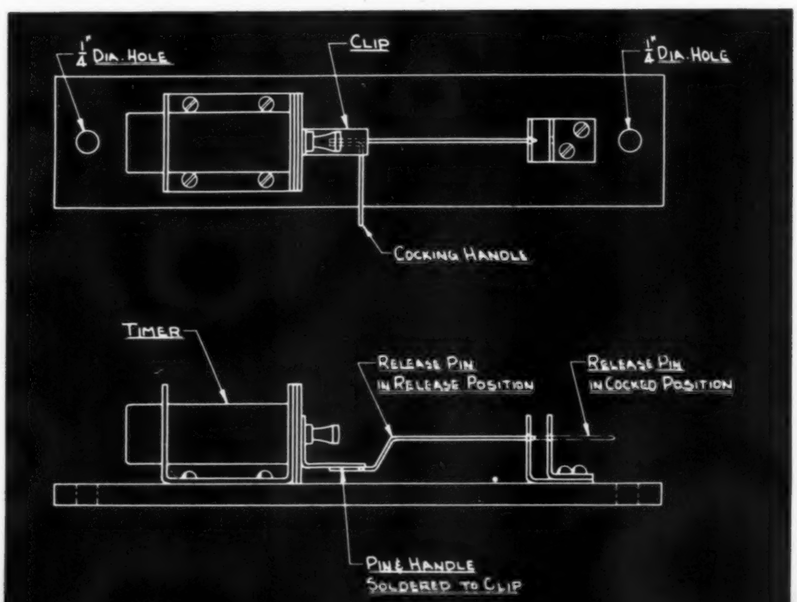
It's simple: Place skid loop in stooge, cock timer, walk to center of circle and wait for release. Gadget is easily made, using any timer.

▶ Lay out timer bracket with four screw holes for mounting to the wood base. Two round cut-outs at each end take the casing of timer. Two holes around one cut-out hold timer to bracket. Bend flanges up at right angles. Two strips for release pin are cut, bent at right angles. Place strips together, drill hole for release pin. Space clips about 1/4 in. apart, drill two screw holes through both for attaching to base.

One brass strip cut to size, drilled for timer plunger and bent, is soldered to release pin and cocking handle which is formed from one or two pieces of piano wire. Plywood base has two 1/4 in. holes for anchor nails. Assemble brass strip under lock nut of timer. Attach timer bracket to base with four wood screws. Attach release pin brackets with two wood screws. Adjust timer for 15 or 20 seconds.

Stake down stooge using two 4 in. nails. Start engine and adjust until it runs smoothly. Set looped tail skid or sub-rudder between angles and anchor in place with release pin. Walk (or run) to handle and wait for release.

Base, 1 1/2 x 1/4 x 7, ply; timer bracket, 1 1/8 x 1/32 x 3 3/4, ST dural; release pin angle, 1/2 x 1/16 x 2 3/4, ST dural; clip, 3/8 x 1/32 x 1 3/8, hard brass; cocking handle and release pin, .040 dia. x 4 1/4, piano wire; six small wood screws; two small self-taping screws; flight timer.



Clinic that Clicked!

(*Continued from page 17*)

This was the only scale model built during the class and the only time that the class deviated from the PAL kits.

All members of the two classes built a model of the B-29. During construction, Forrest Tucker, one of the stars of the picture, visited the clinic and told the boys about his experience while on location at a B-29 base. All of the finished models were displayed in local department stores and were judged by B-29 pilots. The winner was announced at a private showing of the picture for the members of the Model Clinic. The winner also received a wristwatch from Forrest Tucker.

The classes lasted eight months. It gave to the Jaycees the information that was needed for classes of this type to be held on a full time basis. The majority of the members of the class are now in the process of building controlline models and will be ready for the contests next year. But, more important, it proved the interest and need for such a program in the city.

When the city of Charlotte forbade flying of gas models in any of the public parks or school grounds, modelers had to accept the fact whether they liked it or not. There was obtained a field outside of town suitable for flying gas models. However, this past year, in an effort to increase the interest in model aviation of boys who have never had a chance to learn the proper fundamentals, Jaycees de-emphasized the advanced flying, such as gas models, and worked strictly with fundamentals. At one time there were five of these clinics co-sponsored with the churches. However, manpower needs forced condensation to three. The clinics were very successful, following the same idea as the original clinic, but advanced one major step forward.

Witch-on-Broom, at 1953 RAF Championships, flew well enough to take 3rd in unorthodox event.

It would have been impossible for the Jaycees to hold classes and reach all of the interested youths in the city without the help of the churches that expressed a desire to help in the program. Classes were established in 10 to 15 of the local churches with a coordinated headquarters. The planning committee, composed of one instructor from each group, planned contests to be held on a local level and also set the pace so that all groups were kept at the same approximate level at all times. At the peak of this program, membership included approximately 200 boys between the ages of 8 and 16.

A special class in model building for crippled children is now underway in a local hospital.

Last year, instead of holding our Carolinas Model Flying Circus on July 4, which had been the largest meet of its type in the two Carolinas, we held a meet, non-sanctioned, that catered strictly to the beginners in model aviation. The response of the merchants in the town and the publicity in the papers and on the radio were absolutely amazing. With approximately 80 participants, almost every boy went home with a prize of some sort and with a terrific feeling of accomplishment. The meet was limited to youths 8 through 16 years of age. Of course, events were held for flight, exhibition and appearance. The Eddie Rickenbacker Trophy was awarded to the high point winner of the meet. This contest was held on July 25, and no entrance fee at all was charged. Food and refreshments were served, as the meet lasted from

10 o'clock in the morning until late in the afternoon.

After summer vacation started, four new clinics working on the same principles as last year were begun. Two of these clinics are for beginners, and two for an advanced class of boys who were members last year. At the end of this year the advanced class will probably be studying the simple gas-powered model.

We are planning another contest this year that will probably run for two days. The first day will be all models other than gas-powered, and the second day will be the advanced. We feel that by limiting this contest to the boys who are more or less equal in ability and knowledge, we will get many more entries among boys who would otherwise never enter a contest of any type. In addition, once the boys learn contest flying, we feel that they will no longer hesitate to enter a sanctioned meet.

Gas models may have been banned in Charlotte, but model building is alive and kicking—thanks to the Jaycees. END

Hep On Nordic?

(*Continued from page 15*))

modelers in order to gain a further slight advantage. However, steel lines would be dangerous in the proximity of electric power lines.

Towline technique has acquired added importance because it is obvious that there are much closer limits to model performance than with free flight power or rubber models. Even when these latter types are built to standardized dimensions and wing loadings (which largely dictate the optimum glide performance), some variation in over-all performance between models is inevitable with the different rates of climb or altitudes reached with different motors.

Towliners operating from regulation line lengths are, therefore, much seriously affected by any shortcomings on the part of the "pilot"; the actual performance of the model depends to a greater extent on the "flying skill" of the contestant. A good free flight model, once it is properly trimmed, calls for nothing more than a properly running motor and a model pointing in the right direction when released. After that, its antics are literally out of the pilot's hands. The towliner, in contrast, calls for some attention all the time until it is released and one of the most outstanding of European contest men, a top-liner in Wakefield and free flight gas, recently admitted to the writer that he found A-2 flying beyond his capabilities: he could not get the hang of advanced towline technique at all.

Present rules admit a running launch with no limit on the distance run by the launcher. Therefore, since the line length is fixed, one does not winch the model up since this would obviously limit the altitude obtainable. Instead, the entire line length is laid out and the model is towed up with this fully extended at all times; at least, when conditions are good. Under windy conditions, some modelers elect to have a few yards of line held in reserve which they can hurriedly pay out, but if you are reasonably nimble, this isn't really necessary either.

Although a winch is not actually required for towing up, it is necessary to have some such item of equipment because you are required to wind in your towline immediately after the model has been cast off. Furthermore, if you do happen to use a steel wire towline, the winch, plus a drogue or parachute which opens up at the top of the line after casting off the model, is virtually essential to avoid a most frightening tangle of coiled wire.

The usual pattern winch is a converted bench grinder like that shown in the photograph. In place of the grinding wheel, a suitable spool or pulley of wood or metal is fitted and a line guide of heavy gauge wire or drilled strip metal is added to prevent the line from running off the spool. A straight, or spade grip, handle can be fixed to the base of the grinder body. Incidentally, the whole job should be as rugged as possible because if it should be necessary to cast off in a stiff wind, you may have to throw the winch into the air to release the model and, of course, it has to be strong enough to survive the subsequent plunge to earth. For this reason, avoid the sort of grinder which has a flimsy die-cast crank handle.

As we have already noted, it is on the sort of line used that the altitude will, to a certain extent, depend. The danger of using a very light line is, of course, that, if you are not very careful, it may break half-way through the tow and cut your flight time drastically. Whether your thin line, designed for maximum performance, survives the tow

or not depends on the weather conditions and on your ability. Actually, the difference in performance detectable when using a line of "safe" diameter for good average conditions, as opposed to one which is marginal, is not so great as to make the use of the latter type of line worthwhile.

However, for an international contest, in which weather conditions may be totally different from those experienced at home, it is an advantage to have had some experience with different line weights in different wind strengths and to be prepared to change the line, should weather conditions make this necessary. The trouble always comes when, after test flying in what is normally the sort of weather chosen for such activity: i.e., calm or with only moderate wind strength, the contest day turns out to be one of high winds. What would, under normal conditions, be a line of quite adequate strength, will leave no room for mistakes or unexpected gusts and, in some of the earlier A-2 eliminating events especially, we have seen many ruined chances when models have gotten away trailing yards of towline, often with, in consequence, the auto-rudder stuck so that the model has fast disappeared downwind.

A few years ago a great deal used to be written about towline stability as applied to glider design. And it must be admitted that, at that time, the number of gliders seen which would tow up perfectly were so few that it looked as though there were a good deal to be learned about this subject.

One thing we used to be warned about was placing the tow-hook too far back. An idea grew up that the most rearward position for the tow-hook should be located on a line drawn at 60° to the horizontal datum line and passing through the center of gravity. Usually a couple of extra hooks were positioned forward of this: one for moderate wind and the other for stronger winds. More often than not, one of these forward hooks would be used instead and many modelers would only use the "back hook" with some trepidation. If a model weaved about or turned off the line, the cause was invariably pronounced to be "hook too far back."

Only when stiffening competition made it obvious that, without a more rearward location, the full height advantage of a 100-meter line could not be achieved, did a few contest fliers begin experimenting with revised hook locations. We well recall our own mild astonishment when a new model, having a hook at 75°, towed up perfectly and, at first, we were inclined to attribute this to more than a normal share of good luck with the model design. When the same results were achieved with other layouts having rearward hook locations and Scandinavian A-2's were discovered to be using 80° locations, the fallacy of the 60° tow-hook was obvious and complete.

Another favorite source of much theorizing used to be the effect of fuselage shape on stability and ideas regarding the so-called "forward fin" area were responsible for some highly unusual and often quite ugly shapes. We had "flying suitcases," "hatchets" and sundry variations of the pod and boom layout. The latter can probably be justified on account of reduced wetted area and thus reduced drag but A-2 development has clearly shown that none of these unorthodox layouts are essential to stable high-performance flight.

The wide variation in fuselage shapes and dimensions seen among successful A-2 models clearly disproves, in fact, any contention that a great deal of attention has to be given to the shape of this component in order to obtain stability. This is obvious when it is remembered that, on Czepa's 1951 Swedish Cup winner, the fuselage was almost non-existent: it was simply a long hollow spar

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connecting the wing and tail unit and providing a suitable location for the nose ballast to achieve the correct center of gravity location. Moreover, far from having any "forward fin," the only increase in side area on the simple "stick" fuselage was made, not at the nose end (as with the normal pod and boom layout), but at the extreme tail end where it joined the tail unit. Here a simple streamlined pod was built on, just large enough to fulfil the A-2 cross-section rule.

Today, towline stability—or the lack of it—is something of which A-2 designers are not in the least afraid. If a new model does show signs of being unstable under tow and if this is not caused by warps or any part of the structure being otherwise out of alinement, the instability can usually be put into one of two categories and in each of these, one does not have to look very far for the cause of the trouble.

For example, a model which, after launching and climbing a short distance, begins to tow with one wing down and tries to bank away, usually has insufficient dihedral and can be fairly simply cured by raising the tip panels slightly. If, on the other hand, the model tends to swing to and fro on the line, the tow-hook (too far forward) is usually to blame. Having the hook too far back can produce similar symptoms to those indicating marginal dihedral, except that there is less tendency to sideslip and a greater tendency to veer and turn right off the line, but this trouble is unlikely to be encountered if the model has been properly trimmed for hand launching initially, unless the hook is almost directly under the center of gravity.

Since the tow-hook position has such a marked effect on the behavior of the model and on the height achieved (and thus total duration of the model), the location for optimum performance can be quite critical. For this reason, many A-2 designers have adopted adjustable towhooks. The old idea of fitting three hooks about an inch apart is quite inadequate and a much finer adjustment is required. One can, of course, alter the center of gravity location instead and re-trim the model accordingly, but this seems to be an unnecessarily complicated method of achieving the best tow-hook CG relationship.

One method of making the hook position adjustable is to mount it on a plywood keel or skid with small nuts and bolts, the keel being drilled with a number of holes which give four of five different, but closely spaced, positions. If the holes are slotted, an even finer adjustment is possible.

Alternatively, the hook can slide on a rail installed in the bottom of the fuselage. Farrance's Helios A-2 uses this system, there being a short length of inverted T-section brass strip fitted to the bottom of the fuselage on which the hook runs. It is locked in position by means of a small set screw.

In order to keep the model in sight as long as possible an A-2, like all other free flight duration types, is made to circle during the glide. One turn per 20 seconds is about average. This is easy enough to obtain with a simple rudder tab adjustment, of course, but some means of neutralizing the turn during the tow becomes necessary, otherwise the model will tend to turn off the line. One method, used by some British designers, was to offset the tow-hook to one side of the fuselage bottom, so that a counteracting pull was obtained, but a more positive method and the one now almost universally favored is the auto-rudder.

The auto-rudder system is quite simple. It consists of a conventional rudder tab, rubber or spring tensioned against a stop which is adjusted to give the required flight circle diameter. Attached to a small control horn on the other side is a thin steel wire

Christine Zaic of Jasco, with Mr. Keil of Keil Kraft, kit producers, during her recent visit to their factory on the way home from her trip to the World Glider Championships, Bled, Yugoslavia.

(.008 in. controlline wire is suitable) which runs forward through the fuselage, generally to the tow-hook location. Pulling this wire draws the rudder over to the neutral position (a suitable stop is installed) for the climb. The wire is then released automatically when the model is cast off.

Auto-release details differ but the principle is the same in every case. Many modelers simply hook up the end of the rudder wire to the tow-hook so that, when the towing ring is in place, the pull of the towline holds the wire forward and straightens the rudder. The only disadvantage here is that when the tension on the towline is changed (toward the top of the climb) from a forward pull to a slightly downward pull, there may be a tendency for the rudder to come over prematurely and/or to cause slightly premature release of the model itself. The writer therefore favors a separate rudder release trigger of piano wire with a small loop formed at the end. A pin is then passed vertically through this and into a bush or short length of aluminum tube in the bottom of the fuselage immediately under the center of gravity. This pin is attached by a separate length of thread to the towline and is not under tension. Only when the model is deliberately cast off, therefore, does the thread tighten and pull out the release pin.

An alternative rudder system is, of course, the "golf stick" method, but this does not seem to have found favor with A-2 specialists, possibly because (theoretically, at least) it suggests increased weight and drag and thus less height from the tow.

It will be evident from the three-views of four European A-2's given here that design layouts are still quite fluid. We have long and short tail moments, big and small stabilizers, short and long noses, all sorts of fuselage shapes, fins on top and fins underneath. In our second article, next month, dealing with the actual model design, we shall analyze these various trends and summarize the characteristics of the leading A-2's to date.

(To Be Continued)

Irwin Ohlsson, left, Ohlsson Manufacturing Co., with Al Grenoble, who won Mercury car in Gold Seal Slogan contest. His winning slogan was: "East to West it outperforms the rest."

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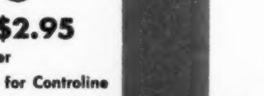
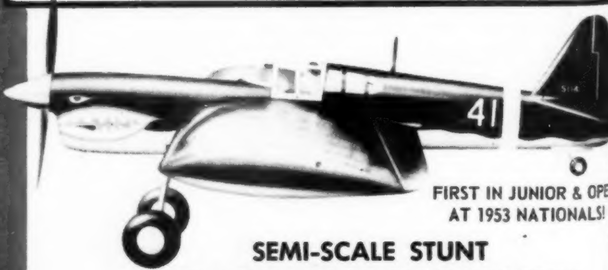
In active duty in Korea, this new liaison plane is perfect in proportions for model work. Plans show it as a free-flight "½ A" gas, with details for rubber and controline conversion. Fuelproof decals, die-cut balsa, plywood and celluloid; shaped and notched wing edges: formed gear, etc.





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"I *borrowed* a McCoy Diesel because it has just the right power required for the Clipper Cargo event. And it convinced me...now, I *own* one!

"My ship 'Blueboy' has a wingspan of 72" with 7" chord; stabilizer, 22½" with 5" chord. Weight without cargo box was 6½ oz.

"Wing and stabilizer covering was pre-war Jap tissue with two thin coats of nitrate dope. Fuselage was sheet balsa with one coat of blue dope...rudders not covered or doped—just raw sheet balsa for weight reduction. Wing construction was normal—a 1/32" sheeting on leading wing edge for rigidity but light weight. This was necessary because of the high aspect ratio—better than 10 to 1.

WHEELS ARE IMPORTANT—"Landing gear was a two-strut type made of 1/16" piano wire. Two-strut gear is more rigid, lighter, and easier to securely mount than corresponding one-strut gear. Also, two strut gear stays in alignment. Location was immediately forward of the cargo box or considerably aft of usual gas model landing gear installations. Aluminum wheels were made by a fellow Oakland Cloud Duster. They are 1" diameter and 1/32" thick with 1/8" diameter hub, 1/4" wide. Wheels are true running and wobble free because of wide hub and don't squash as do ordinary rubber wheels. Inasmuch as take-off run is some 30 to 40 feet, wheels are important.

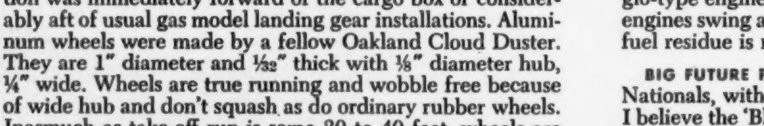
PROPELLERS COUNT TOO—"Various propellers were tried. One, the winning flight of 23¾ oz., a 7x3 Top Flite was used. A 7x2 Tornado worked well also and allowed engine to develop more RPM. On an unofficial flight (due to engine over run) the ship lifted 26½ oz. with a 7x2 Tornado for 2:40. The more load, the more effective pulling power required *from a standstill*. This is best had by a low pitch prop.

McCOY DIESEL JUST RIGHT—"A McCoy Diesel had just the power required—ability to swing a low pitch 7" prop at high RPM. McCoy fuel (which is excellent in all respects), allows use...and broad use...in not only McCoy Diesel engines but all other Diesels, especially foreign makes. Starting procedure is different from glo-plug type and takes a bit of practice to master. Diesels start easy. All in all, the McCoy Diesel has extremely high power, is lightweight and easy to mount. It is capable of much more power than comparable glo-type engines, swings a low pitch 7" prop while glo-plug engines swing a 5x3. The Diesel has another big advantage—fuel residue is not harmful to the model's finish.

BIG FUTURE FOR DIESELS—"In conditions such as at the Nationals, with a good runway and about a 12 MPH wind, I believe the 'Blueboy' capable of lifting 30 oz. dead weight. Above 30 oz., a shock absorbing landing gear will be needed and construction must be stronger. But 30 oz.—about five times the weight of the model—isn't bad."

Hal Roth

McCoy *famous "Checkered Flag" line...*



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